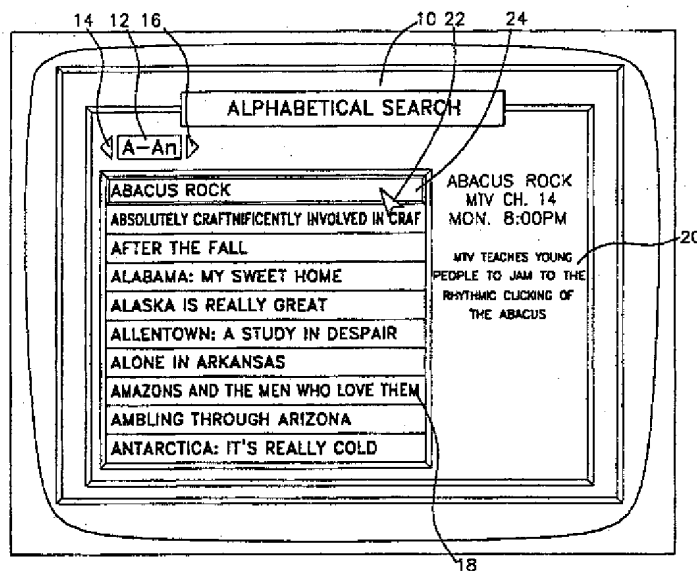




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(54) Title: EPG WITH ALPHA SORTING FEATURE



## (57) Abstract

An electronic program guide includes an alpha-sorting feature for generating a display listing program titles, and descriptive information associated with a highlighted (24) one of the displayed program titles, according to a symbol selected by a viewer. A letter of the alphabet is displayed in a small window (12) and titles that begin with the letter in the small window are displayed in a column in a second window (18). Details about the program having the highlighted title are displayed in an area (20) adjacent to the large window. An EPG action can be invoked directly from this guide.

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## EPG WITH ALPHA SORTING FEATURE

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## BACKGROUND OF THE INVENTION

The present invention generally relates to television schedule information, and more particularly to a system and method for providing previews of scheduled programming to assist a viewer in making scheduling decisions.

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As the number of television stations in a metropolitan area or on a cable network has increased, the number of programs of potential interest that are presented to a viewer has risen dramatically. With the use of dish antennas capable of receiving direct satellite signals, the multitude of programs available to the viewer has further increased.

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Additionally, television faces a digital future that will see the merger of television and PC technology. The television set of the future will include a micro-computer, a modem of interconnectivity with other computers over networks, intranets, and the internet, and be connectable to computer peripherals such as printers. Such capabilities as near "video on demand" (NVOD), "video on demand", "access to the world wide web", "audio on demand", etc. will present the viewer with a plethora of information and bandwidth.

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As has become increasingly evident, information overload can actually reduce the usefulness of the information delivered. Accordingly, a great challenge exists to provide an interface that manages and provides an intelligent, user-friendly interface to the information available.

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Consequently, television schedule systems that are provided directly on the viewer's television screen have been developed to assist the viewer in sorting through these various programs and determining which programs to watch or record. One such television schedule system is disclosed in commonly assigned U.S. Patent No. 5,353,121 (Young et al.), the complete disclosure of which is hereby incorporated by reference. In one embodiment of Young, the television schedule includes a series of menu screens having an array of cells corresponding to different television programs. The viewer may scroll through the cells to view which television programs are being presented on various channels at various times. In addition, the viewer may select certain cells to obtain more information on the associated program or to pull up other submenus with additional options.

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The recent development of television schedule systems, such as the above described patent to Young, have created many new challenges. In particular, a viewer may wish to search for programs when the time or channel for broadcasting the program is unknown. In other cases, the user may not know the name of the program.

## SUMMARY OF THE INVENTION

5 According to one feature of the present invention, programs may be alphabetically searched by title.

According to another aspect of the invention, program title information, selected according to a selection symbol, and associated descriptive information are displayed in response to viewer input.

10 According to another aspect information, EPG functions may be performed based on interaction with a response screen.

Other features and advantages of the invention will be apparent in view of the following detailed description and appended drawings.

## BRIEF DESCRIPTION OF THE DRAWINGS

15 Figs. 1A and B are schematic diagrams of screen displays for implementing an alpha sorting feature;

Fig. 2 is a schematic diagram of a TV system;

20 Fig. 3 is a block diagram of a hardware unit for generating an on-screen electronic programming guide (EPG);

Fig. 4 is a schematic diagram of the hierarchical database utilized to generate the EPG;

Figs. 5 to 10 are schematic diagrams of data structures in the database;

Fig. 11 is a schematic diagram depicting the transmission of an EPG in a digital satellite system; and

25 Fig. 12 is a flow chart depicting the operation of an embodiment of the alpha sorting function.

## DESCRIPTION OF THE PREFERRED EMBODIMENT

### Overview of the EPG Alpha Sorting Feature

30 A conventional electronic program guide (EPG) typically displays programming in a number of different formats, including a grid or matrix with channels listed vertically, times listed horizontally, and guide entries placed in the grid entries indexed by a particular channel and time. However, the present invention employs a different format that is particularly well suited to identify television programs arranged alphabetically by title. Figs. 1A and 1B depict a preferred embodiment of the invention. In this format, the EPG 10 has a small window 12 across which the letters of the alphabet scroll horizontally, a large window 18 that lies under window 12, and an area 20 adjacent to window 18 in which program details are displayed. Scroll command arrows 12 and 16 lie on the sides of window 12. When a viewer moves an on-screen

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5 cursor 22 over arrow 12 or 16 or enters a command by pressing a right or left arrow key on a remote controller, the letters of the alphabet pass across window 12--in ascending order if arrow 16 is selected and in descending order if arrow 14 is selected. The titles of the television programs beginning with the letter appearing in window 12 are displayed in alphabetical order in a column in window 18.

10 When a viewer moves cursor 22 over one of the titles in window 18 or enters a command by pressing an up or down arrow key on the remote controller, the selected title is highlighted on the screen, for example by displaying the background 24 of the highlighted title. Details about the program having the highlighted title are displayed in area 20. Fig. 1A illustrates the nature of the details in area 20 in the case when the program having the highlighted title has a single episode. Fig. 1B illustrates the nature of the details in area 20 in the case when the program  
15 having the highlighted title has multiple episodes. Note that details, such as channel, day, and time, of unhighlighted titles are not displayed. Preferably, only the titles are displayed, so that there is ample space to display more details about the program having the highlighted title and the screen remains uncluttered by non-essential information. The titles in window 18 scroll vertically when the cursor reaches the top or the bottom of window 18. New titles can appear on the screen either one at a time or a page at a time. If the titles appear a page at a time, the  
20 range of titles on the page can be depicted in window 12, as illustrated in Figs. 1A and 1B, i.e., "A-An" depicted in window 12 for the titles "Abacus Rock" to "Antarctica: It's Really Cold" in window 18. Although the position of the highlighted title moves in the described embodiment, it could remain fixed in location, i.e., at the middle of the screen and the list of titles could scroll vertically to change the selected title.

25 The contents of windows 12 and 18 could be linked unilaterally or bilaterally. In the unilateral case, when the viewer has scrolled through all the titles beginning with the letter appearing in window 12, the scrolling stops and another letter must be selected before the viewer can scroll through any other titles. In the bilateral case, when the viewer has scrolled through all the titles beginning with the letter appearing in window 12, the scrolling continues to titles  
30 beginning with the next letter and the next letter appears in window 12. Thus, in the bilateral case the viewer can navigate through the titles by either rapidly scrolling in window 12 or more slowly scrolling in window 18. In both cases, as the viewer scrolls through the titles, the details in area 20 change accordingly.

35 Although window 12 used as described above is the preferred mode of selecting the list of titles displayed in window 18, the selection could be made in other ways. For example, the multiple character boxes disclosed in PCT Application WO 96/17473 published on 6 June 1996 could be used to select the list of titles.

5 The described program guide can be used in the same manner as a grid or matrix guide to schedule programs for recording or watching or to tune the television receiver to a current program. The viewer simply highlights the title of the desired program in window 18 and then presses an appropriate key on the remote controller. Alternatively, icons could be displayed on the screen to enable the viewer to select the desired function with cursor 24.

10 In a preferred embodiment, the EPG system includes a database (described in detail below) including a table of show title entries. This database is utilized to generate the programming grid.

15 The sorting "alphabet" is not limited to the characters A-Z but may include any defined initial characters in a database (such as 0-9) or divisions of the alphabet (such as B1 if there are too many "B"s to sort effectively). Special cases such as the upside-down question mark or exclamation point in Spanish-language titles or initial articles such as "The" can also be utilized as sorting symbols.

#### Overview of an EPG System

20 In a preferred embodiment, the electronic program guide of the invention may be implemented either on a personal computer, a PCTV, a television connected to a set-top box, or a television including a custom board. However, the invention is not limited to any particular hardware configuration and will have increased utility as new combinations of computers and television systems are developed. In the following any of the above will sometimes be referred to as a "TV system". Block diagrams of representative TV systems are depicted in Fig. 2. Details of implementation are not depicted because the invention is not limited to any particular TV system.

25 As is well known, the picture to be displayed may be transmitted as an analog signal, for example according to the NTSC standard utilized in the United States, or as a digital signal modulated onto an analog carrier. The signals may be received over a cable or via an antenna or satellite dish. Typically, television sets are designed to receive analog signals and computer display devices are designed to display pictures encoded in a digital format. However, the decoder system converts the digital data to an analog signal for display on a television set and TV modems can format analog TV signals for display on a monitor.

30 In Fig. 2, analog or digital TV signals, received via cable 30, antenna 32, or satellite dish 34, are provided to a television system. If the signal is from a digital broadcast service, then a decoder 36 converts the signal to baseband video and audio or channel 3/4 RF. If the signal is an analog signal it is passed through as a live video output. The television system 38, depending on its configuration, receives selected ones of the outputs and displays the received program.

5 A PCTV includes a TV card 40, connected to either live video, baseband video, or channel 3/4 output, digitizes the video image and displays the video image in a resizeable window on the computer monitor. The PCTV is also coupled to land telephone lines by a modem 42.

10 If the received signal is an analog TV signal the TV card of the PCTV digitizes the analog signal and extracts included information from the vertical blanking intervals. On the other hand, if the signal is a digital signal separate audio, video, VBI (vertical blanking information such as closed caption, teletext, and program related information), program guide, and conditional access information are provided as separate bitstreams. The video and audio bitstreams for programs are converted to a format for display and the program guide information is processed to form a program guide database. The processor, executing software stored in memory, generates interactive electronic program guide images and images of received programs. The guide can be used to interact with and control programs displayed in the window.

15 A television system configured to display an electronic program guide such as a guide provided by StarSight Telecast includes an on-screen display controller and other hardware described below. If a standard analog broadcast signal is received, program guide data is extracted from the VBI by a VBI data slicer and processed to form a program database. If a DBS digital signal is received, either from a satellite or cable, VBI and program data are provided in separate bit streams. The program guide images are either generated locally or remotely and provided to an on-screen display controller. Interactivity is provided via a remote control.

20 Alternatively, the program guide can be displayed on a computer monitor that interactively controls the television set through, for example, an IR interface, including an IR blaster 44, to generate IR codes to control the television and/or a VCR.

25 If the electronic guide database is generated locally, the system for creating the electronic programming guide must receive television schedule information and process the received information to create a database. Thus, the system requires a data reception unit, a processor, memory to store program code and a database, an on-screen display generator (OSD), and a control interface for tuning to selected channels.

30 In one preferred embodiment, the schedule information is transmitted as a set of short commands of specified formats. Different commands communicate information such as a show schedule for a given channel, the title of each show in the schedule, descriptions and information attributes about each show in the channel. Thus, information for a show to be broadcast at a particular time is transmitted in several commands. ID numbers in the commands facilitate organizing the information into a relational database utilizing database engine (DBE) software stored in memory and executed by the processor.

5 In a preferred embodiment, a board is included at a viewer's television set and the database is stored locally and commands are transmitted in the VBIs of programming on a designated channel, for example PBS. An example of a board for receiving program guide information, generating program guide database, displaying the program guide, and interactively controlling the program guide is depicted in Fig. 3. The commands are transmitted to the board in the vertical blanking intervals of programming broadcast on a designated channel.

10 Alternatively, the commands could be transmitted to the local unit over land telephone lines. Additionally, as described below, in some systems the database is built remotely and the guide itself is transmitted to the local unit.

15 The database engine builds a hierarchical database in the RAM. The hierarchical structure of the database is depicted in Fig. 4. The database is structured internally as schedule data structures and theme data structures linked by handles and handle tables. Each handle is an index to a handle table which contains pointers to blocks of memory where items of the database are stored.

In another embodiment, for example a DSS system, program guide data is transmitted as a bit stream that is processed by the database engine.

20 Additionally, a N.E.W.S. (news, entertainment, weather, and sports) database has been developed. Commands including story text and story IDs are transmitted. Links from the program guide to stories related to a program can be created and the related stories can be accessed from the guide.

25 An advertisement database is also created from commands including advertising text and logos including IDs for linking the ads to shows displayed in the EPG. The user may access the advertising information directly from the guide.

30 An internet database is also created from commands including URLs to internet sites related to programs displayed on the EPG. If the viewer is viewing the EPG on a platform that is Web enabled, e.g., WebTV, a PC, or PCTV, then a linked site can be accessed directly from the EPG.

Additionally, a graphics program module builds various displays utilizing schedule, show title, and other information from the database. If the OSD controller operates in the character mode the display is a grid of character codes which are transferred to the OSD controller which generates the on-screen display.

35 An input-response user interface program module responds to user input to generate new displays responsive to the particular input. In one preferred embodiment, the user utilizes an input device, e.g., a remote control, mouse, or keyboard, to place a pointer over a part of the current display and click. The input-response module responds to the position of the pointer and



5 the particular display currently displayed to generate a responsive display or take a particular action. In another preferred embodiment the user interface responds to function buttons on a remote control. Specific examples will be described below.

## DETAILED DESCRIPTION OF THE EPG SYSTEM

### Board Description

10 Fig. 3 is a block diagram an embodiment of the electronic hardware unit 52 utilized to perform the electronic on-screen schedule display and other functions. The particular hardware unit 52 depicted is for TVRO (TV Receive Only) customers having home satellite dishes for television viewing. This unit is coupled in series with existing customer TVRO equipment.

15 In Fig. 3, the unit receives Baseband Video in 123 from the customer TVRO system. The unit optionally outputs Baseband Video out 128 or channel 3/4 RF out 130. The unit includes an 8-bit microprocessor 100, 64 bytes of code ROM 101, 512K of RAM 102 for program data storage, a custom gate array 103, segmented base registers 104 for fast memory data manipulation, security logic 106 for decoding incoming encrypted data, a serial bus 108 for display controller interface, serial bus 110 for inter-processor communication, watchdog timer 112 for error recovery, IR input 113, IR transmitter circuits 116 for TV, VCR control, IR output 20 117, CRC-32 encoding and decoding logic 118, on-board power supply 120, video input 123, On-Screen Display Controller and Formatter 124, custom color converter 126, RF modulator 127, choice of Baseband Video or RF outputs 128 or 130.

25 The on-screen display controller and formatter (OSDCF) 124 functions as an I/O controller, an on-screen display controller (OSD), and also as a closed-caption data (CCD) VBI data slicer. The VBI (vertical blanking interval) is a dead space in a TV signal that allows a television signal to reposition the scanning electron beam from the bottom to the top of the screen. Digital data, for example close-captioned data, is modulated onto the carrier signal during the VBI.

30 The OSDCF 124 includes an analog-to-digital convertor (ADC) which digitizes the incoming baseband video and extracts digital information transmitted in the VBIs. As explained more fully below, messages for transmission to the database are transmitted in the VBIs. These messages are transferred to the processor 100 which executes a database engine process to build or update the database.

35 The OSD part of the OSDCF 124 includes cache memory, character memory, timing functions, and an external RAM. The OSD reads high level graphic commands sent from the processor 100 and stores graphic information in the RAM. The OSD outputs red (R), green (G), blue (B), graphic data which is used to generate a local video signal. Depending on the state of

the user input interface, described below, the OSD local "video output or the incoming live video will be displayed.

Accordingly, screen display graphic data generated by the database engine is transferred to the RAM of the OSD which then generates a local video signal that causes the display screen to be displayed on the television screen.

### Scheduling Data Structures

The DBE builds a hierarchical database in the RAM. The hierarchical structure of the database is depicted in Fig. 4. The database is structured internally as schedule data structures and theme data structures linked by handles and handle tables. Each handle is an index to a handle table which contains pointers to blocks of memory where structures of the database are stored.

The hierarchy for the schedule data structures, in descending order, is:

- Channel Data Table:** contains subscriber unit's list of channels;
- Show List:** contains time slots for each show scheduled to be broadcast for a channel;
- Show Title:** contains the title text and show title attributes;
- Show Description:** contains show's ratings, attributes, and description text.

A channel data table, depicted in Fig. 5A, is the highest data structure in the hierarchy. This table includes an entry for each channel received by the subscriber unit.

The entries in the channel data table are changed infrequently and are determined by the location of the subscriber unit and type of services received. Each channel data table entry includes information concerning the channel and a handle to a show list handle table for the channel.

The next data structure in the hierarchy is the show list depicted in Fig. 5B. The show list includes a start time typically being midnight GMT and 24 hours of scheduling. The channel's schedule is given by an ordered sequence of show slots, with a show slot for each show to be broadcast by a particular channel for a particular day. Each slot includes a duration, show title handle, and show description handle. Finding an entry corresponding to a given start time requires the entries to be scanned, in order, from the beginning of show list and adding duration values.

The database, when fully constructed, holds a week's worth of show lists for each channel. The days of the week are accessed by incrementing the show list handle by two bytes. The show lists are updated each day at midnight GMT, with the show list for the day just completed being deleted and the show list for same day next week being added to the database.

5 The next data structures in the schedule hierarchy are the show title entries, depicted in Fig. 5C, and show description entries, depicted in Fig. 5D. For a given show slot the show title entry and show description entry are accessed utilizing the handles included in the slot. The show title and show description entries are stored in a memory pool divided into blocks. Each show title is identified by a unique 20-bit show identification number (SID) and each show description is identified by a unique 20-bit number assigned at the head end. The show title handles are based on the SID and the show title handles are offsets into a show title handle table. The entry  
10 in the show title table accessed by a particular show title handle includes the address of the first block in the memory pool where the show title entry is stored. Similarly, the show description handle table entry accessed by a show description handle stores the address of the first block in the memory pool where the show description entry is stored.

15 Each show title entry includes a theme index ID and the text of the show title. Typically, a single show title entry will be referenced by many show lists for different channels, days, and times. Thus, by utilizing handles in the show lists all show lists reference a single show title entry in memory so that memory is efficiently used. Many show title entries have a long life because the show titles may be for series that are broadcast over long periods of time and may be  
20 referenced by many show lists since many shows are broadcast by multiple channels.

Each show description entry includes a theme index ID, critic's rating, MPAA rating for the show, traits mask bits, year produced, and show description text. Show description entries tend to have a shorter life than show title entries because a description is only valid for a particular episode of a series.

### 25 Schedule Search

To obtain schedule information for a particular time and to display the schedule information in the programming grid requires the following steps. For each channel in the channel list, the show list for the day is accessed and scanned. Horizontal blocks for the channel  
30 are sized according to the duration of the show slots including and following the selected time. The show title entry referenced by each show slot is accessed and the show title is displayed in the horizontal block corresponding to the show slot.

### Ad Data Structures

35 An ad list data structure is similar to the show list. It includes a start time and 24 hours of ad scheduling. The ad list is regionalized and includes an ad slot for each ad to be broadcast for a given day. The ad slot includes a duration and an Ad ID utilized to access an ad entry.

Each add entry includes an ad banner text field, an ad text field, and a pointer to an ad logo, if appropriate. The ad logo includes a graphics file to be displayed with the ad.

The ad entries include the ad banner text and ad text.

#### Building the Database

The database is built by a database engine software module operating on the processor. Messages comprising discrete commands are received by the database engine. Examples of commands include a Region Command which specifies channels available for a particular subscriber unit to be included in the Channel Data Table; a Channel Data command including information utilized to form the entries in the Channel Data Table; and show list, Show Title, and Show Description commands including SIDs and DIDs referencing areas in memory. The database engine selects only show list Commands relevant to channels included in the Channel Table for further processing.

The database engine creates storage locations in memory for all SIDs and DIDs included in any show list. Information included in commands having matching SIDs or DIDs is written to the referenced memory area. In practice the SIDs and DIDs are processed by a hashing system for more efficient searching.

The messages may be transmitted to a subscriber unit in various ways. A system for receiving messages in the VBIs of broadcast programming has been described above. In a DBS system the messages may be transmitted in a dedicated bit stream.

In a DBS system video baseband signals are digitized, compressed, and modulated onto analog carrier signals. Because of advances in the art of compression, a carrier once used to transmit a single program can now transmit four programs. Typically, in addition to video signals other bitstreams encoding information such as audio, VBI (vertical blanking information data such as closed caption and teletext), program guide information, and conditional access information, are provided as separate bitstreams, multiplexed into a composite bit stream, and modulated onto a carrier signal.

Alternatively, the database itself may be transmitted in a digital data stream. Typically, a digital data stream includes headers for classifying different portions of the data in the stream. The data stream transmitted from a satellite includes video data in the format specified by the Motion Pictures Expert Group (MPEG) standard, MPEG audio data, and EPG data.

The MPEG video and audio data is decoded and transformed into signals which may be utilized by a television, monitor, or other display devices. The EPG data is stored in a buffer and utilized by a controller to generate an EPG display and to tune to correct programs specified by user input data.

5 For example, in DSS the program guide information is transmitted in blocks of 3 hours of programming for 36 channels. Programming is digitally modulated onto different bands. As depicted in Fig. 6, a satellite has several transponders 500 simultaneously transmitting on different bands. Several channels can be modulated onto a single band utilizing digital compression techniques. A bit stream including the current programming is carried by all bands. However, future programming for different blocks of channels is transmitted on different bands. 10 The blocks are transmitted as a carousel or endless loop so that there may be a delay before a particular time band is received.

A decoder at the viewer's location receives 16 carriers and controls a tuner/demodulator to select one carrier. The carrier is sampled, decoded, error-corrected, and demultiplexed to separate the various bit streams. The decoder includes video decoder chips which decompress 15 compressed video to reconstruct pictures of virtually any size.

When the viewer accesses the guide the block for that time period is loaded into memory so that the user can interact with the guide. For a future time and different channel there may be a time delay. For example, if the current programming block were B1 and the block currently received is B4 the user must wait for blocks B5, B6, and B7, to be transmitted before the current 20 programming can be received and displayed. The viewer would wait for a time delay equal to the sum of time durations for transmitting each block, i.e.,  $d5+d6+d7$ . If the program guide block is modulated onto a different band the cable box must tune to the band and wait until the desired block is transmitted on the carousel, so if the guide is accessed for future programming there could be a delay.

25 For cable the database is built at a programming data center and sent over land-lines to the cable head end. The cable company sends data any way it wants, e.g. VBIs, satellite, digital, etc.

Instead of processing the data at the viewer terminal as described above, all the data could be stored and processed at a central station, e.g., a head end, and called by the viewer terminal on a screen by screen basis. This requires of course a high speed backlink to the central station. 30 Alternatively, some of the data could be stored and processed at the central station.

#### Uses Interface

35 The user interface takes remote control commands as its primary input. In one embodiment a user requests various functions by pressing function buttons on a remote control. In another embodiment, the GUI is utilized with different interactive regions on a displayed screen corresponding to different functions. The user moves the cursor over the interactive region corresponding to a desired function and selects the function to generate a command. The

particular form of entering a command is not critical and technology for utilizing voice commands may soon be available.

The user interface receives commands and responds with a requested display screen and by performing the function requested by the command. The function performed may be to perform an action such as recording a program, tuning to a channel, accessing a related internet site, purchasing a pay-per-view program, or purchasing merchandise. The data and format of each screen is dependent on the previous screen, time of day, the contents of the database, the command received, and other parameters. A state table is used to define the screen flow.

For every defined screen, there is an entrance function, an exit function, an update function, and an array of request-handling functions. The entrance function is called when a state is first entered to collect all necessary data and format the screen. The exit function is called to release memory and data for the screen. The update function is called once per minute to update the screen time and to re-draw the screen if any information displayed on the screen needs to be updated.

Once in a particular state, the table contains a reference to another software function corresponding to each key on the remote control or to each interactive region on the screen. These referenced functions will be executed whenever an associated remote control button is pressed or interactive region is selected.

For example, if the user wishes to record a program, in the GUI embodiment, the viewer moves the cursor over the record interactive region which is then selected to request that the recording function be performed. A confirmation screen will then be generated. Once the user confirms the recording request, an entry is made in a recording queue. A record daemon is then called from the real-time executive to examine the queue and manage recording functions.

The screens are displayed by the on-screen display (OSD) controller based on graphic display commands issued by the database engine. Among the primitive commands needed to draw system display screens are the Erase Screen Command; Draw Rectangle Command; Save Rectangle Command; Restore Rectangle Command; Move Rectangle Commands; Write ASCII String Command; and Draw Channel Icon Command.

Each screen includes areas that are constant and based on code and data stored in non-volatile memory and variable areas such as show titles and descriptions which utilize data stored in the database. As described above in the description of the database engine, the database is structured to facilitate efficient searching for information, generally in the form of ASCII text strings, stored in the database. Additionally, graphics files are also being stored in the database to be displayed in windows of the display screen.

## DETAILED DESCRIPTION OF THE ALPHA SORTING FUNCTION

5 Fig. 7 is a flow chart depicting the steps of performing the alpha sorting function. As represented by a block 26, window 12 is displayed as a letter selection input. As depicted in Figs. 1A and 1B, and described above, a GUI is utilized which preferably includes scroll buttons to move forward and backward through the alphabet. The scroll buttons are interactive regions activated by the user to scroll through the alphabet to select a particular letter.

10 When a letter is selected, as represented by a block 27, the processor executes software, as represented by a block 28, to sort the show list entries and select those entries having the selected letter as the first letter in the entry. If desired, all the show list entries could be alphabetized in advance to speed up the selection of the titles after the first letter is entered. The other tables in the database are then utilized, as described above, to generate details, i.e., descriptive information, such as channel, time of broadcast, and show summaries associated with  
15 each selected show title entry.

An alphabetical program guide is then built as depicted in Figs. 1A and 1B displaying the show title entries beginning with the selected letter. The list of titles in area 18 is in columnar form on a background of tiles, one tile for each title. One of the tiles is changed in color or shading from the others, by cursor 22 to highlight the title overlying the tile. The details of the  
20 program having the highlighted title are recovered from the EPG data base stored in RAM, as represented by a block 29. As represented by a block 30, the selected show titles are displayed in window 18 and details of program of the highlighted show title are displayed in area 30. If the sorting function is performed in advance, the titles displayed in window 18 could change on "on the fly" as different letters are displayed in window 12. Alternatively, the titles displayed in  
25 window 18 could appear after a delay if the sorting function is performed in real time each time a new letter appears in window 12. If a highlighted show title is scheduled to be broadcast multiple times then the episodes are listed in area 30, as depicted in Fig. 1B.

To schedule a program having a highlighted title for recording or watching or some other  
30 EPG action, the viewer invokes a pop-up menu listing the choices of EPG actions by pressing a key on the remote controller or clicking on an on-screen icon. When the selects a choice from the pop-up menu, the selected EPG action is carried out.

The invention has been described with reference to the preferred embodiments. Alternatives and substitutions will now be apparent to persons of skill in the art. For example,  
35 although the preferred embodiment utilizes a television system the invention is applicable to a PC system. Additionally, the particular structure of the database is not critical to the invention. Numerous techniques exist for searching and sorting database entries to form a list in alphabetical order and these techniques can be used with the present invention.

## WHAT IS CLAIMED IS:

5

1. A method of providing program scheduling information to assist in selecting video programming, said method comprising:

displaying an alpha-sorting screen having a selection area for selecting a sorting symbol;  
responding to a selected sorting symbol to generate a list of program titles identified by  
10 the selected sorting symbol;  
generating descriptive information associated with each program title in the list; and  
displaying a response screen including said list of program titles and said associated  
descriptive information.

15

2. The method of claim 1 wherein:

said sorting symbols are alphanumeric symbols; and information indicating when an  
associated program is to be broadcast and channel information indicating the channel on which  
an associated program will be broadcast.

20

3. The method of claim 1 further comprising the steps of:

displaying an action pop-up window when a displayed program title is selected; and  
responding to user input to perform an action in said action pop-up window.

25

4. An electronic program guide (EPG) comprising:

means for storing EPG data including titles of television programs and details about the  
television programs;

means for displaying one or more letters of the alphabet in a first area of a display screen;

means for recovering from the stored EPG data and displaying in a second area of the  
screen a list of titles beginning with the one or more letters displayed in the first area;

30

means for selectively highlighting one of the titles displayed in the second area; and

means for displaying in a third area of the screen details of the program having the  
highlighted title.

35

5. The EPG of claim 4 additionally comprising means upon command for scheduling  
the program having the highlighted title for recording or watching.

6. The EPG of claim 4 additionally comprising means for scrolling the titles displayed  
in the second area.



5           7.     A method for selecting television programs from a data base including titles and details of the programs, the method comprising the steps of:  
          selecting a letter of the alphabet;  
          displaying titles in the data base that begin with the selected letter;  
          highlighting one of the displayed titles; and  
          displaying details of the program having the highlighted title without displaying details  
10   of any of the other displayed titles.

          8.     The method of claim 7 in which the selecting step comprises scrolling the letters of the alphabet across a small window.

15           9.     The method of claim 7 in which the selecting step comprises scrolling the letters of the alphabet across a small window horizontally.

          10.    The method of claim 7 additionally comprising the step of scrolling the titles in the data base that are displayed.

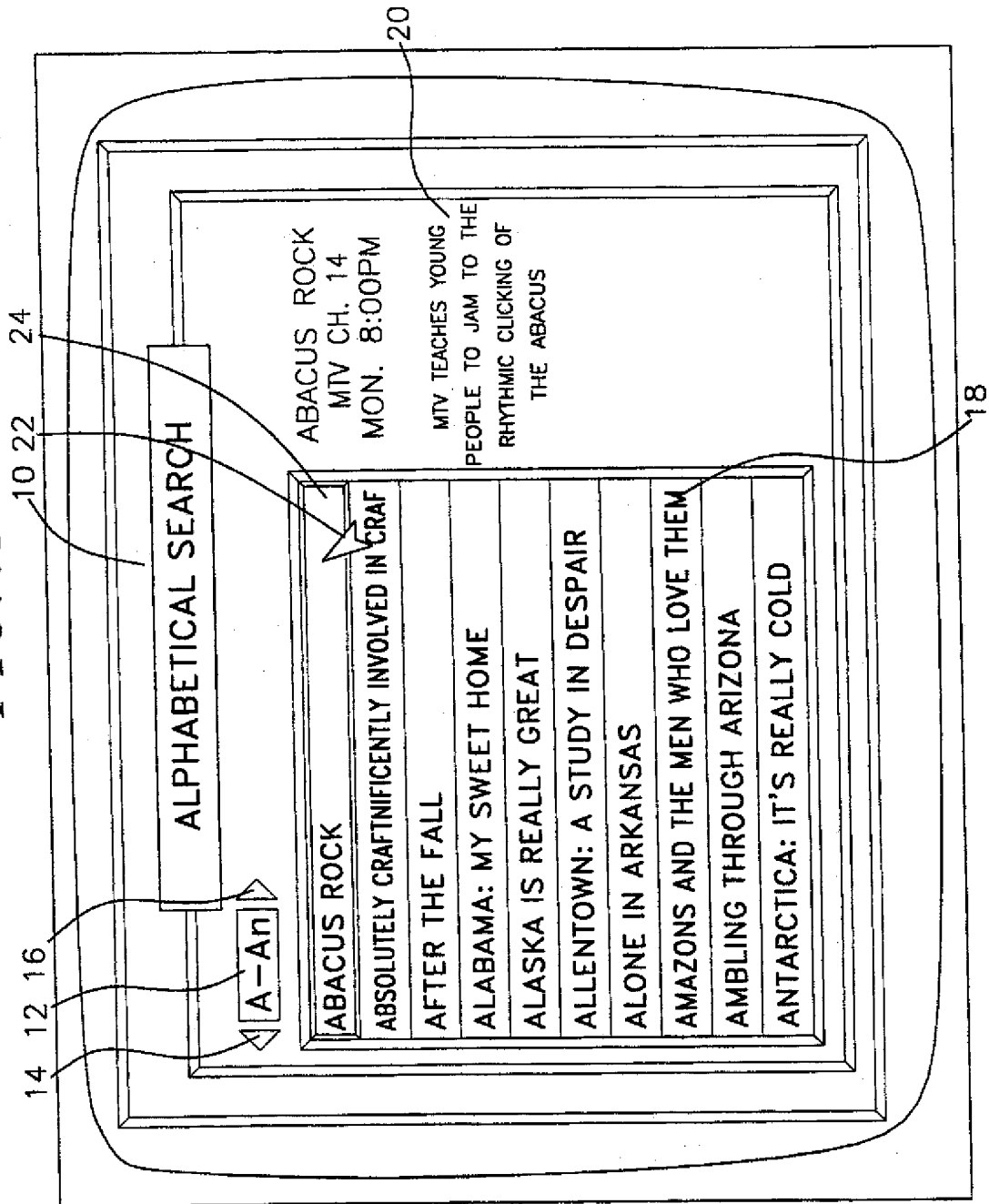
20           11.    The method of claim 7 in which the titles of the data base are arranged in pages and the selecting step displays the beginning letter or letters of the first title and the last title on a page.

25           12.    The method of claim 11 additionally comprising the step of changing the displayed titles a page at a time as the selecting step changes the beginning letter or letters of the first title and the last title on a page.

30

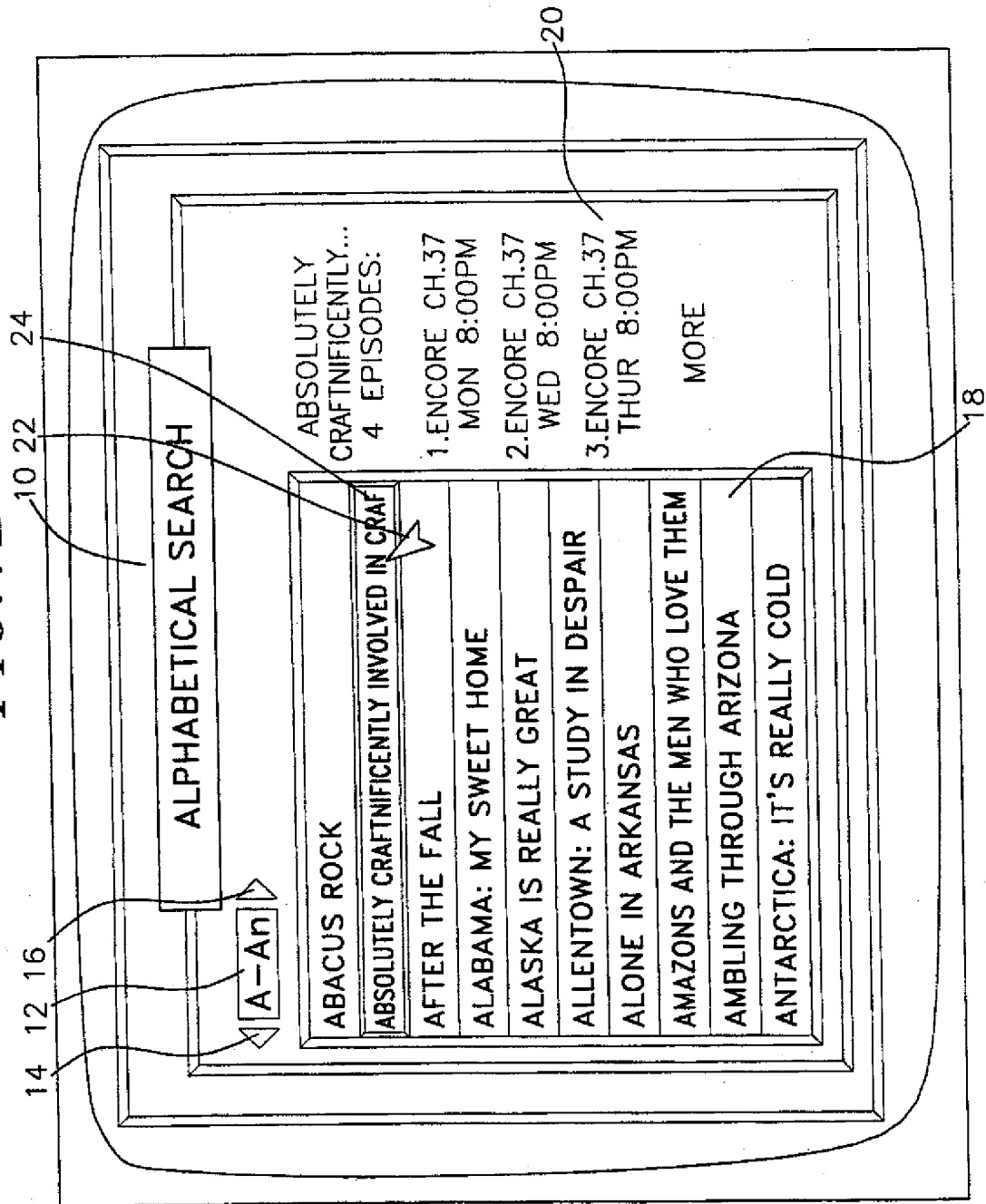
35

FIG. 1A



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FIG. 1B



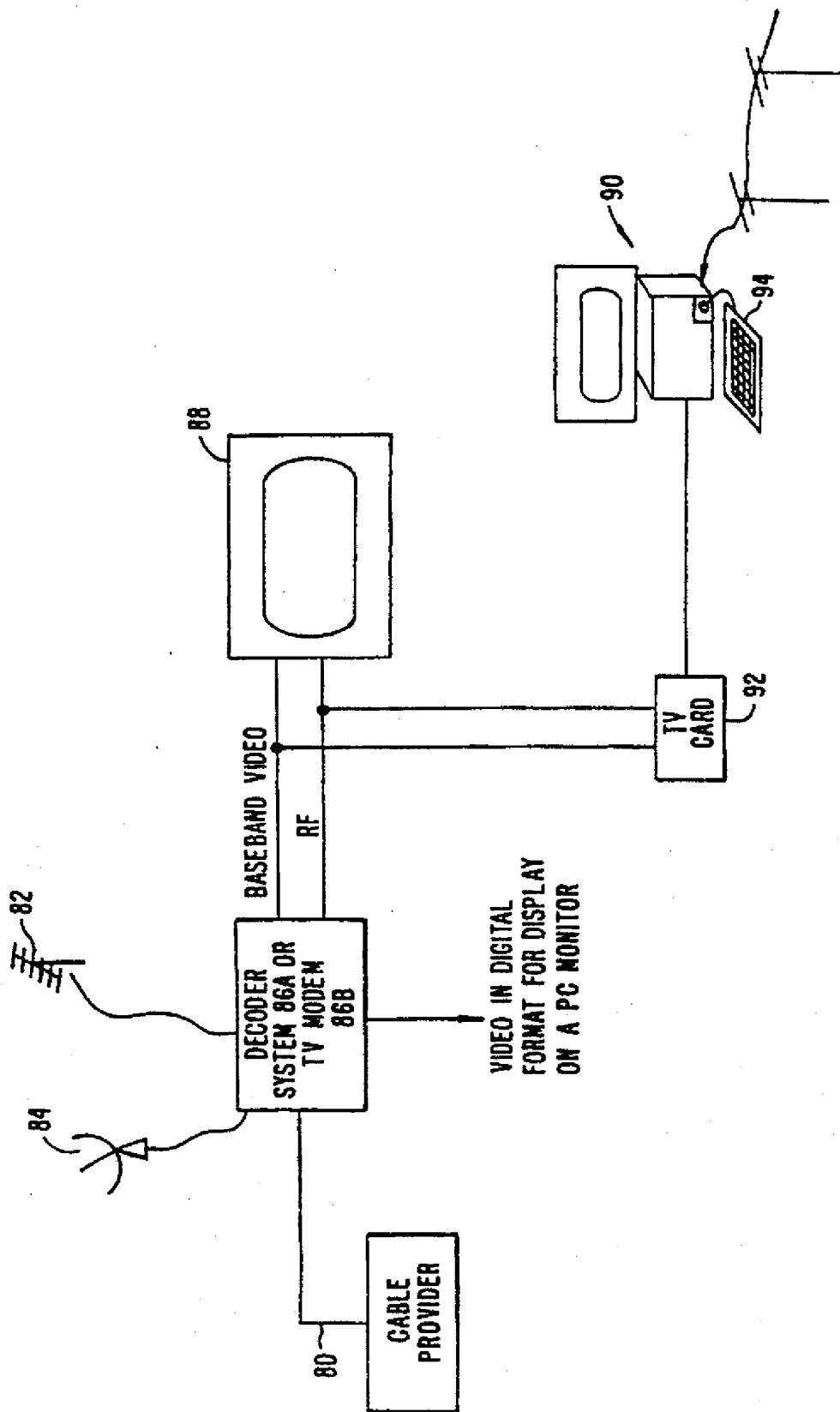


FIG. 2.

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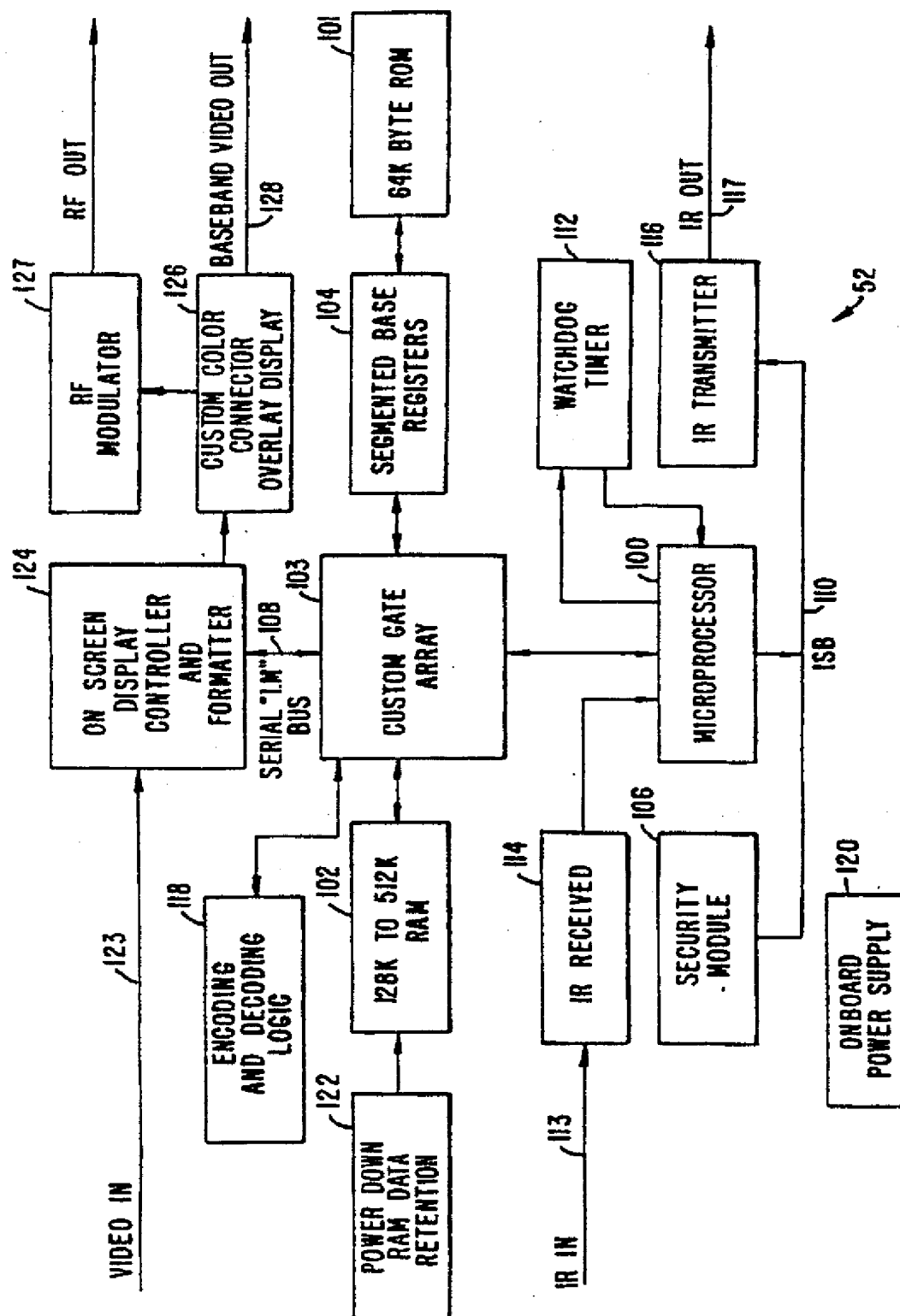


FIG. 3.

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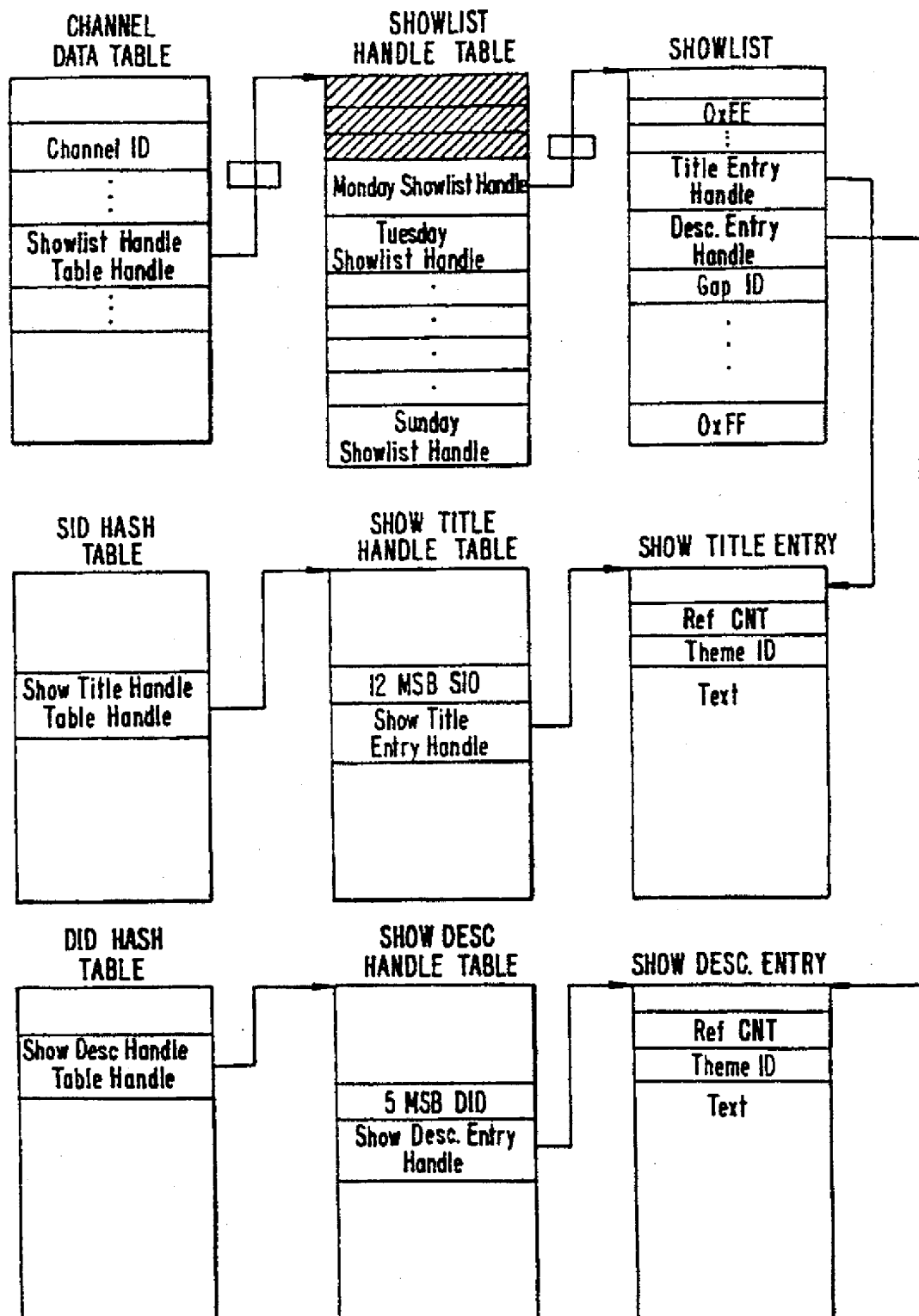


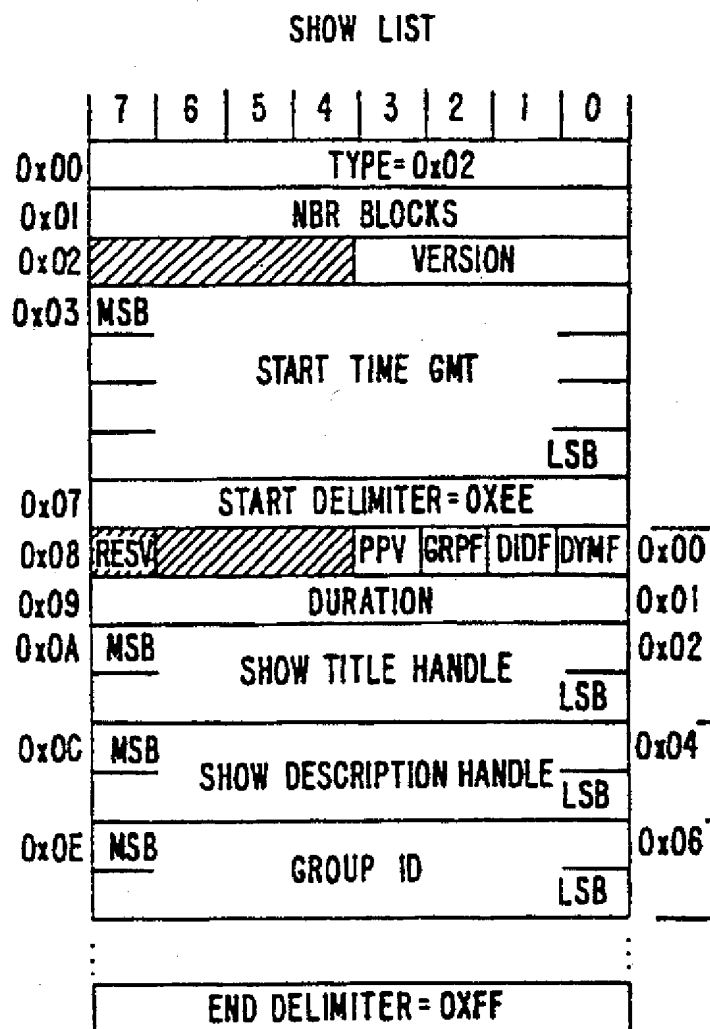
FIG. 4.

### CHANNEL DATA TABLE

	7	6	5	4	3	2	1	0	
0x00	TYPE = 0x01								
0x01	NBR BLOCKS								
0x02	0x00								
0x03	NBR CHANNELS								
0x04	MSB		CHANNEL ID				LSB		0x00
0x06	DPF	ICF	NDF				NF	TMSB	0x02
0x07	TUNE CHANNEL NBR								0x03
0x08	TRANSPONDER NBR								0x04
0x09	SATELLITE NBR								0x05
0x0A			SOURCE		CHANNEL TYPE		NMSB		0x06
0x0B	NATIVE CHANNEL NBR								0x07
0x0C	NAME MASK BITS								0x08
0x0D	FAVORITES LINK								0x09
0x0E	MSB		SHOWLIST HANDLE TABLE				LSB		0x0A
0x10	HANDLE								0x0C
	NAME AFFILIATION STRING								
0x18	MSB		DUPLICATE CHANNELS				LSB		0x14
	HANDLE								

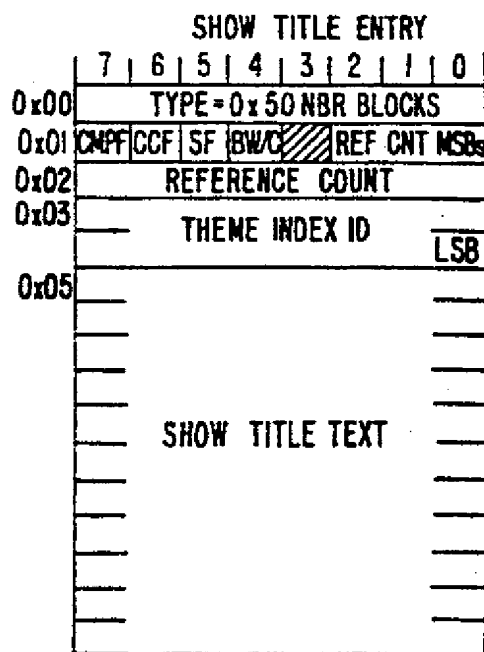
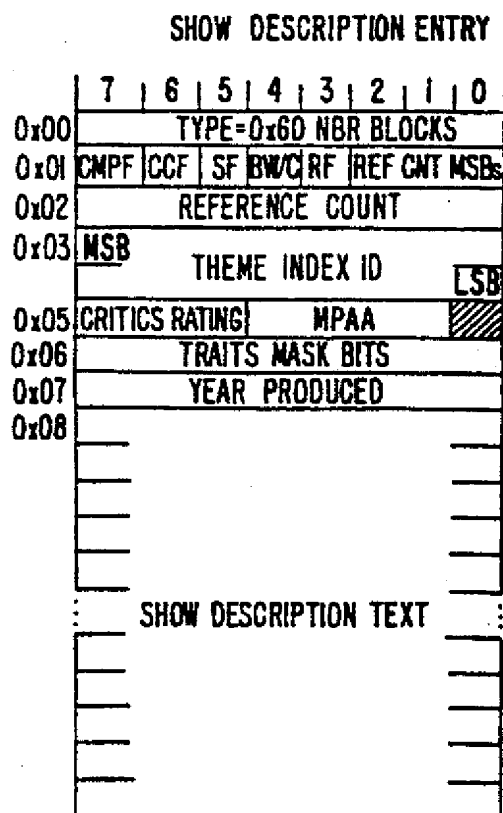
**FIG. 5.**

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**FIG. 6.**



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**FIG. 7.****FIG. 8.**

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THEME CATEGORY TABLE								
	7	6	5	4	3	2	1	0
0x00	TYPE= 0x05							
0x01	NBR BLOCKS							
0x02	VERSION							
0x03	NBR THEME CATEGORIES							
0x04	THEME CATEGORY ID							
0x05	ATTRIBUTES FLAG							
0x06	MSB	THEME SUBCATEGORY						LSB
0x07	HANDLE TABLE							
0x08	CATEGORY NAME LENGTH							
0x09	MSB							LSB
	THEME CATEGORY NAME							
...	...							
0x0M								

FIG. 9.


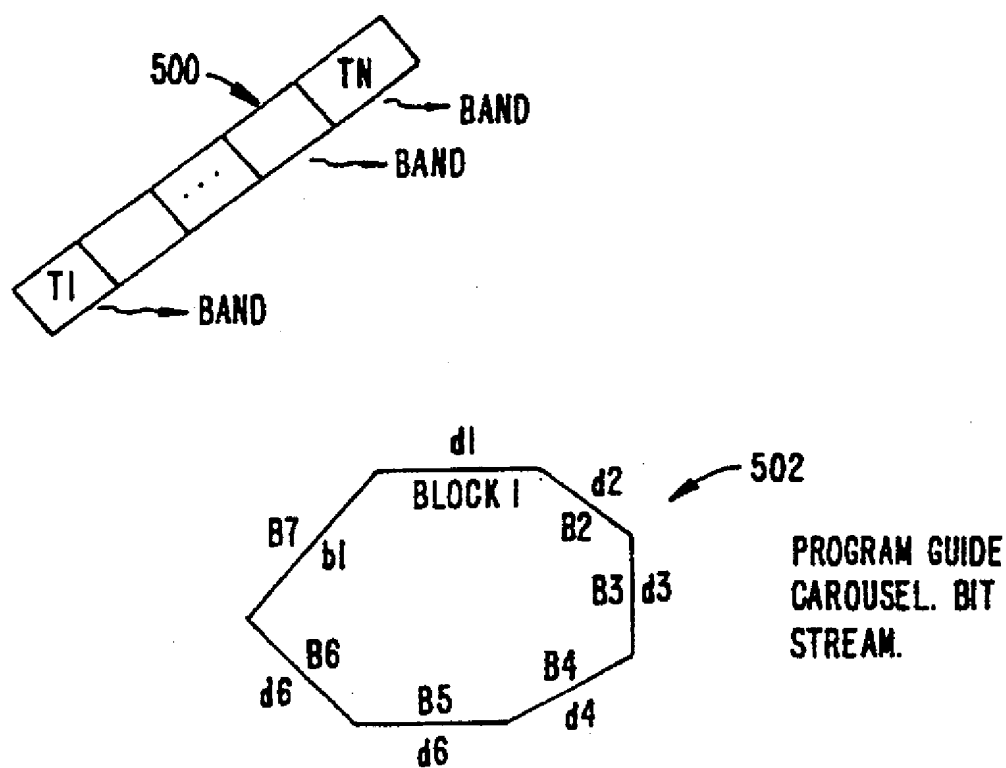
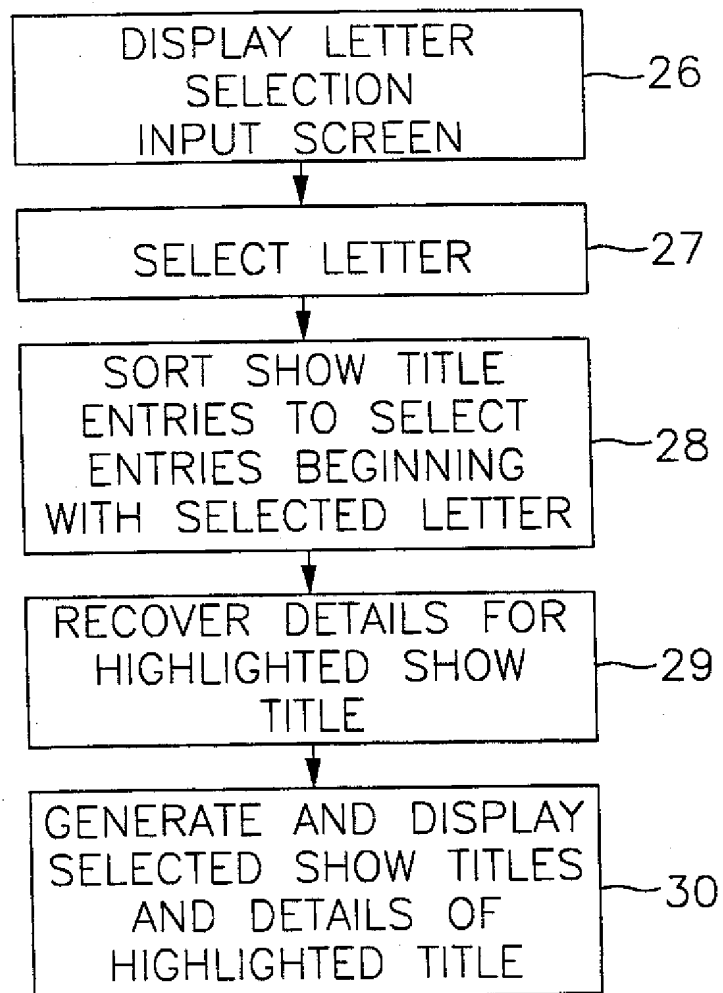
THEME SUBCATEGORY TABLE								
	7	6	5	4	3	2	1	0
0x00	TYPE = 0x06							
0x01	NBR BLOCKS							
0x02	THEME CATEGORY ID							
0x03	NBR THEME SUBCATEGORIES							
0x04	THEME SUBCATEGORY ENTRY LENGTH (m)							
0x05	ATTRIBUTES FLAG							
0x06		NBR THEME INDECIES (k)						
0x07	MSB	THEME ID 1						LSB
0x09	MSB	THEME ID 2						LSB
...								
6+2k	MSB	THEME ID k						LSB
8+2k	MSB							LSB
THEME SUBCATEGORY NAME								
...								
0xm								LSB

FIG. 10.



**FIG. II.**

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*FIG. 12*

## INTERNATIONAL SEARCH REPORT

International application No.  
PCT/US98/26175

## A. CLASSIFICATION OF SUBJECT MATTER

IPC(6) : H04N 7/10, 5/445, 7/08

US CL : 348/6, 563, 473, 906

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

U.S. : 348/6, 563, 473, 906

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 5,850,218 A (LAJOIE et al) 15 December 1998, Fig. 28; Fig. 22; col. 27, lines 64-66 thru col. 28, lines 1-26; col. 31, lines 1-67	1-12
X	US 5,629,733 A (YOUMAN, et al) 13 May 1997, Fig. 38D; Fig. 38E; col. 31, lines 1-66 thru col. 32, lines 1-16; col. 17, lines 60-67; col. 18, lines 33-45;	1-12



Further documents are listed in the continuation of Box C.



See patent family annex.

* Special categories of cited documents:	*T* later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
*A* document defining the general state of the art which is not considered to be of particular relevance	*X* document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
*B* earlier document published on or after the international filing date	*Y* document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
*L* document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)	*Z* document member of the same patent family
*O* document referring to an oral disclosure, use, exhibition or other means	
*P* document published prior to the international filing date but later than the priority date claimed	

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**WO 01/47238 A2**

(54) Title: **DISTRIBUTED, INTERACTIVE TELEVISION PROGRAM GUIDE; SYSTEM AND METHOD**

(57) Abstract: In an interactive network-based personal video recording system, a user interface is provided that allows viewers to search a database of program guide information according to program title, indexed program attributes such as actor and director, and key workd. Viewer interaction is by way of a remote control unit.

## **DISTRIBUTED, INTERACTIVE TELEVISION PROGRAM GUIDE; SYSTEM AND METHOD**

### **BACKGROUND OF THE INVENTION**

5

#### **FIELD OF THE INVENTION**

The invention relates generally to a network-based video recording system. More particularly, the invention relates to a method and apparatus for searching a client-side database of program guide information to identify  
10 program items of interest.

#### **DESCRIPTION OF RELATED ART**

The number of programming options available to television viewers is constantly increasing, with television programming now available from the  
15 major networks, cable channels, satellite, pay-per-view, community access television, and so on. Paralleling this growing availability of television programming is a decrease in the amount of leisure time viewers have for watching television; due to job demands, time spent commuting, family responsibilities and the like. Because of these severe schedule constraints,  
20 the complaint is pervasive among viewers that "There's nothing on" when they do have time for television viewing, in spite of the unprecedented availability of television entertainment. This complaint is more a result of the difficulty of matching one's own schedule to network television schedules than it is due to quality or availability of television programming. The ability  
25 provided by VCR's and other recording devices to make automatic, unattended recordings of television programs has freed viewers from the dictates of network scheduling.

However, the viewer is still faced with the time-consuming chore of  
30 examining schedules for literally hundreds of television channels to identify programs of interest. As a result, electronic program guides have been developed to help viewers deal with the mass of programming information.

Typically, such guides are provided in cable and satellite television environments. The program information is presented in a grid format, organized by time slot and channel. The guide is displayed by scrolling across the screen. However, these guides are not interactive; they cannot be searched, nor can the viewer control the display of information in any way. The viewer must simply passively watch the information scroll by, hoping that something useful or interesting will pass by.

Searchable program guides are now available. For example, S. Schein, J. Leftwich, *Method and apparatus for searching a guide using program characteristics*, U.S. Patent No. 6,133,909 (October 17, 2000) describe a searchable program guide that allows a viewer to search according to program attributes such as actors or directors. The guide described by Schein, *et al.* eases the viewer's task of locating programs of interest. Unfortunately, the described guide only allows the user to search the guide according to indexed attributes, such as actor or director. However, indexed attributes often fail to anticipate a user's search behavior. Thus, Schein, *et al.* do not provide the user with any way to search outside of those indexed attributes.

From the foregoing, it is apparent that an interactive program guide that affords the viewer more flexible search options would be a significant technological advance.

25

### SUMMARY OF THE INVENTION

The invention provides a method and apparatus for searching a database of program information in an interactive, network-based video recording system, in order to identify programs of interest. A viewer enters search terms using a virtual alphanumeric keypad displayed in a viewer interface by means of a remote control. The viewer may search according to program title, indexed attributes such as category, actor, and director; or a key word



search allows the viewer to search by program content or subject matter. A prefix matching capability provides a type-ahead feature, so that search terms may be rapidly located in the appropriate index simply by entering one or more of the leading characters of the search term.

5

### **BRIEF DESCRIPTION OF THE DRAWINGS**

Figure 1 shows a block diagram of an interactive, network-based video recording system, according to the invention;

10

Figure 2 shows a top-level screen of a viewer interface for searching an interactive program guide, according to the invention;

Figure 3 shows a screen from the viewer interface of Figure 2 for searching by title, according to the invention;

15

Figure 4 shows an alphanumeric keypad for searching by title, according to the invention;

20

Figure 5 shows an alphanumeric keypad for searching by actor name, according to the invention;

Figure 6 shows a category list for narrowing an actor name search, according to the invention;

25

Figure 7 shows an alphanumeric keypad for searching by keyword, according to the invention; and

Figure 8 shows a category list for narrowing a keyword search, according to the invention.

30

## DETAILED DESCRIPTION

In an interactive, network-based video recording system, a searchable program guide is provided to facilitate the task of identifying programs of interest by the viewer. As shown in Figure 1, a viewer interface 1 to a client unit 3 provides a series of interactive screens that incorporate interface elements such as text boxes, searchable lists, selection bars, and alphanumeric keypads. The viewer navigates the interface and generally interacts with the system by means of a hand-held remote control 4 that communicates with the client unit by means of a data signal 5. In the preferred embodiment, the data signal is embedded in an IR carrier signal, but other carrier signals known to those skilled in the art of wireless data transfer would also be suitable. Typically, the interface is displayed on the screen of a television set 2 connected to the client unit. However, other display means would also be suitable. The client unit is in periodic contact 6 (the arrows denoting the network connection are dashed to indicate the intermittent nature of the connection) with a server 7, during which time, current program information, originating from a vendor, is downloaded to the client unit. After downloading, the program information is imported into a database application resident on a fixed storage medium such as a disk drive. The current embodiment of the invention employs an object-oriented database application, but other types of database applications, such as relational databases, would also be suitable.

Referring now to Figure 2, shown is a top-level screen 20 to the search interface. A selection bar 21 highlights the various search options available. The first option 22, allows the viewer to search the program guide according to program title. A second option 23, allows the user to create search profiles that search according to actor name, director name, category and key word. In addition, other search options are possible. For example, expanded search functionality may include indices for year of release, language, choreographer, or any other program attribute that could be indexed. Navigating arrows 24 advise the viewer of the navigation options

available. For example, in Figure 2, a 'right' arrow 24a navigates the viewer to a screen (Figure 3) for searching by title; a 'down' arrow 24b allows the viewer to scroll through the list of provided options; and a 'left' arrow 24c navigates the viewer back to the previous screen. If the selection bar were positioned farther down in the list of options, an 'up' arrow (not shown) would permit the viewer to scroll up the list. The 'up,' 'down,' 'right' and 'left' arrows are operated by pressing corresponding buttons on the handheld remote control 4. In the example of Figure 2, the viewer selects 'Search by title' 22.

Referring now to Figure 3, a screen 30 is shown that gives the viewer the option of narrowing a title search according to program category, or not, according to the viewer's need or desire. By selecting the 'all programs' option, the search is performed in the entire program database. Selecting a category 32, limits the search to programs defined by the corresponding category descriptor. Limiting a search by category would be most useful when the viewer is browsing for a program of particular type. If the viewer desired to maximize retrieval, or if they were searching for a specific program for which they knew at least a portion of the title, limiting by program category might be less useful.

After choosing a category, the user is navigated to a screen as shown in Figure 4. Shown is a screen 40 displaying a virtual alphanumeric keyboard 41 and a text box 44. The viewer uses the navigation controls (not shown) on the remote control to position a selection marquee 48 around the character of choice. When the selection marquee is properly positioned at the desired character, the viewer presses a 'select' button, upon which the selected character appears in the text box 44. The viewer continues selecting characters, until they have entered at least a portion of the program title in the text box. 'Clear,' 'space' and 'delete' functions 45, 46 and 47, respectively, are provided for clearing the box, inserting a space between words, and deleting single characters. Prefix matching gives the screen a type-ahead capability. Thus, as the viewer enters characters, the title list 42 automatically scrolls to the program items having prefixes that match the

character string entered by the viewer. As described previously, the directional arrows 24a - d advise the user of the navigation options available to them. As shown in Figure 4, the selection marquee is positioned around the character 'T' in the rightmost column of the keypad 41. In this case, navigating to the right would cause focus to shift from the keypad to the title list 42. 'Up' and 'down' arrows 43a and b indicate that the viewer may scroll up or down in the title list.

As described above, the viewer may create search profiles in which they search according to indexed program attributes or keywords. Program attributes may include actor name, director name, category, choreographer, language, year of release, and the like. Figure 5 shows a screen 50 for searching according to actor name. It should be noted that searching according to indexed attributes or key word requires the creation of a search profile. When the search profile is created, it may be saved and named. Interaction with the search screen 50 is analogous to that previously described for the title entry screen, thus it will not be further described. As Figure 6 shows, following entry of an actor name, a screen 60 allows the user to narrow a search according to category, if desired. Another set of screens (not shown) is provided for searching according to director name. Their appearance and function is analogous to those for searching according to actor name, thus they will not be further described.

Figures 7 and 8 show screens 70 and 80 for searching according to key word and narrowing according to category, respectively. As previously described, keyword searching requires the creation of a search profile. As will be described below, key words are extracted from actor and director names, titles and a narrative program description.

The key word search feature is highly advantageous in that it provides an important additional access point not found in conventional program guides. It is a well-known problem to those skilled in the design of publicly accessible information retrieval systems that it is impossible to anticipate a

user's search behavior with complete certainty. Thus, no matter how skillfully indexed an information base may be, it will be unable to accommodate the information-seeking behavior of all users. Therefore, to provide a system that delivers maximum serviceability to its constituency, it is highly desirable to provide as many different access points as possible. By including a key word search feature, the current invention provides an important, highly flexible means of accessing program content and subject matter outside of the indexed attributes.

10 The method of interacting with the key word search screens is exactly analogous to the screens previously described. Thus, they will not be further described.

## 15 INDEXING

As previously noted, the video recording system of the present invention is network-based, consisting of a central server, and a plurality of client units, each client being in periodic communication with the server. In the preferred embodiment of the invention, the network connection is a dial-up connection over a publicly available telecommunication network. However, other network connections, a wireless connection, for example, would be equally suitable. In the preferred embodiment of the invention, the client is in communication with the server for a brief period on a daily basis. During the daily connection period, the client downloads current program guide data.

20 The downloaded program information is imported into an object-oriented database resident on the client. As previously indicated, when a viewer searches the database to find programs of interest, they may search by program name, by indexed attributes such as actor name or director name; and by keyword. A direct, sequential search of the records in the database objects would be prohibitively time-consuming and would waste system resources, unfavorably affecting the usability of the program guide. Thus, the database is indexed, and searches are conducted on the provided index files, greatly improving search efficiency.

25 30

While the database may include other objects, the title search feature is concerned primarily with the 'Series' object. The attribute search and key word search features are concerned primarily with the 'Program' object. The

5 'Series' object includes a record for each television series. For the title search, the most important field of the 'Series' object is the series 'Title' field. The attribute search and the key word search are concerned primarily with the 'Program' object. The 'Program' object includes a record for each individual program item, where an individual program item might be a single

10 episode of a series, for example. The 'Program' object includes at least the following fields:

- Title;
- Episode title;
- Description;
- 15 • Actors
- Hosts;
- Guest stars; and
- Directors.

20 The above list is not intended to be limiting. Other record configurations consistent with the spirit and scope of the invention are possible. Information is extracted from the individual records and assembled into a series of index files. For the title search feature, a 'Title' index is constructed. For the attribute search feature, 'Actor' and 'Director' indices are built. Finally, for the

25 key word search, a 'Key word' index and a 'Title word' index are provided.

Generally, the process of indexing the database includes the following steps:

- Extracting index terms from the database records;
- Constructing intermediate files from the extracted index terms;
- 30 • Creating raw, unsorted index files from the intermediate files;
- Sorting the raw index files; and
- Compressing the sorted files to form final index files.

The several steps of the indexing process are described in greater detail below.

- 5 For the 'Title' index, the entire series title is extracted as a text string from the 'Title' field of each 'Series' record, with each text string constituting a separate index term, or key.

- 10 For the 'Actor' index, each name is extracted from the 'Actors,' 'Hosts' and 'Guest stars' fields of the 'Program' records, with each name from each record constituting a separate actor key. Similarly, for the 'Director' index, each name is extracted from the 'Directors' field, with each name from each record constituting a separate director key.

- 15 For the 'Title word' index, each separate word, having a length of at least two characters, of each title from both the 'Title' and 'Episode title' fields is extracted, with each separate word constituting a separate title word. For the 'Key word' index, each separate word having a length of at least two characters is extracted from the 'Description' field, with each occurrence of  
20 each word constituting a separate key word.

- Following key extraction, the keys are assembled into intermediate files: one for each of 'Title,' 'Actor,' 'Director,' 'Title word' and 'Key word'. The 'Title' intermediate file includes the 'Title' keys, the 'Actor' intermediate file includes  
25 the 'Actor,' 'Host' and 'Guest star' keys, and the 'Director' intermediate file includes the 'Director' keys, with the names in the 'Actor' and 'Director' keys listed directory style: last name and first name, separated by a comma. The 'Title word' file includes the title words extracted from the 'Title' and 'Episode title' fields of the 'Program' object. The 'Key word' file, however, is  
30 constructed differently from the previous intermediate files. Each key word forms a separate entry in the 'Key word' file. Additionally, actor names are incorporated into the 'Key word' index. The actor names are parsed into separate first and last names, and then added to the 'Key word' intermediate

file. Thus the 'Key word' file includes the words from the, 'Description' field and the name words from the 'Actors,' 'Hosts' and 'Guest stars' fields. The end result of this step is an intermediate file for each of 'Title,' 'Actor,' 'Director,' 'Title word' and 'Key word,' each comprising a simple listing of the  
5     respective keys or index terms, in a text file.

The intermediate files are subsequently used to build raw, unsorted index files. Each key of the intermediate files described above is paired with a program identifier that corresponds to the record that the key originated from.  
10    The program identifier is a system-generated, alphanumeric identifier, distinct from the program identifiers assigned by commercial programming information vendors such as TRIBUNE MEDIA SERVICES. The raw index files take the form of delimited text files; however other data structures, such as tables, would be equally suitable. In the preferred embodiment of the  
15    invention, the files are formatted as follows:

```

    <KEY> <TAB> <PROG ID>
    .
    .
20    .
    .
    <KEY> <TAB> <PROG ID>.
```

25    As will be described further below, a binary search algorithm is employed to search the indices, requiring that the index be sorted. Thus, the raw index files are sorted on the keys.

30    The sorted index files are subsequently compressed by eliminating redundant keys, so that each distinct key is paired with a list of the program identifiers corresponding to each occurrence of the key in the database. In the preferred embodiment of the invention, the compressed index files are also delimited text files, formatted as follows:

35



CAT	<TAB> <ID <sub>1</sub> , ID <sub>2</sub> , ..., ID <sub>N</sub> >
LASER	<TAB> <ID <sub>1</sub> , ID <sub>2</sub> , ..., ID <sub>N</sub> >
STAR	<TAB> <ID <sub>1</sub> , ID <sub>2</sub> , ..., ID <sub>N</sub> >
TREK	<TAB> <ID <sub>1</sub> , ID <sub>2</sub> , ..., ID <sub>N</sub> >

5

Where 'cat,' 'laser,' 'star' and 'trek' might be title words or key words and 'ID<sub>1</sub>, ID<sub>2</sub>, ..., ID<sub>N</sub>' is a list of program identifiers for each unique key.

### SEARCH ALGORITHM

- 10 A search engine employing a binary search algorithm is used to search the various indices. In general, the binary algorithm begins with an interval covering the whole search space. The search space is repeatedly divided in half according to how the search value compares with the middle element. If the search value is less than the item in the middle of the interval, the interval
- 15 is narrowed to the lower half; otherwise it is narrowed to the other half. The operation is performed until the search value is found or the interval is empty.

- As described above, the key word search includes title words. Therefore,
- 20 during a key word search, a binary search of both the 'Keyword' index and the 'Title word' index is performed.

- Although the invention has been described herein with reference to certain preferred embodiments, one skilled in the art will readily appreciate that
- 25 other applications may be substituted without departing from the spirit and scope of the present invention. Accordingly, the invention should only be limited by the Claims included below.

## CLAIMS

What is claimed is:

5

1. A system for searching a distributed, interactive television program guide database, wherein a viewer searches said database to identify programs of interest, said system comprising:

a server;

10

a client, wherein said client is in periodic communication with said server, and wherein said client downloads current program information from said server;

a program guide database resident on said client, wherein said program information is imported into said database;

15

an interactive viewer interface displayed on a display means in communication with said client;

means for interacting with said viewer interface by said viewer;

means for searching said database according to program title;

means for searching said database according to indexed program

20

attributes; and

means for searching said database according to key words.

25

2. The system of Claim 1, wherein said system is a component of an interactive, network-based video recording system.

3. The system of Claim 1, wherein said interface comprises a plurality of screens having interface elements for navigation, entering search values and displaying search results.

30

4. The system of Claim 3, wherein said means for interacting with said interface comprises a remote control unit, said remote control unit communicating with said client by means of a data signal.

5. The system of Claim 4, wherein said data signal is embedded in a carrier signal.

6. The system of Claim 4, wherein said means for searching said database according to program title comprises a screen for optionally selecting a program category.

7. The system of Claim 5, wherein said means for searching said database according to program title further comprises a screen for entering a program title and displaying a list of program titles, said screen for entering a program title comprising:

a virtual alphanumeric keypad for entering characters to spell said program title;

a text box for displaying said entered characters; and

15 a scrollable list of program titles, wherein a prefix matching feature causes said list of program titles to automatically scroll to titles in said list having prefixes that match a character string displayed in said text box.

8. The system of Claim 7, wherein said viewer enters characters by activating controls on said remote control that correspond to virtual controls on said keypad.

9. The system of Claim 4, wherein said means for searching said database according to indexed attributes comprises:

25 a screen for searching according to Actor name;

a screen for searching according to Director name; and

separate screens preceding said Actor name screen and said Director name screen for optionally selecting a program category.

30 10. The system of Claim 9, wherein said screen for searching according to Actor name comprises:

a virtual alphanumeric keypad for entering characters to spell said Actor name;

a text box for displaying said entered characters; and

a scrollable list of Actor names, wherein a prefix matching feature causes said list of Actor names to automatically scroll to Actor names in said list having prefixes that match a character string displayed in said text box.

5

11. The system of Claim 10, wherein said viewer enters characters by activating controls on said remote control that correspond to virtual controls on said keypad.

10 12. The system of Claim 9, wherein said screen for searching according to Director name comprises:

a virtual alphanumeric keypad for entering characters to spell said Director name;

a text box for displaying said entered characters; and

15 a scrollable list of Director names, wherein a prefix matching feature causes said list of Director names to automatically scroll to Director names in said list having prefixes that match a character string displayed in said text box.

20 13. The system of Claim 12, wherein said viewer enters characters by activating controls on said remote control that correspond to virtual controls on said keypad.

25 14. The system of Claim 4, wherein said means for searching said database according to key word comprises a screen for optionally selecting a program category.

30 15. The system of Claim 14, wherein said means for searching said database according to key word further comprises a screen for entering a key word, said screen for entering a key word comprising:

a virtual alphanumeric keypad for entering characters to spell said key word; and

a text box for displaying said entered characters.

16. The system of Claim 15, wherein said viewer enters characters by activating controls on said remote control that correspond to virtual controls on said keypad.

5

17. The system of Claim 4, wherein said indexed attributes include any of:  
Actor name;  
Director name;  
Host name;  
10 Guest star name;  
Choreographer;  
Year of release;  
Category; and  
Language.

15

18. The system of Claim 1, wherein said program guide database comprises an object-oriented database application, said database application including at least:

20 a 'Series' object; and  
a 'Program' object.

19. The system of Claim 18, wherein said 'Series' object includes a series 'Title' field.

25 20. The system of Claim 19, wherein said program guide database further comprises a 'Title' index, said 'Title' index being built from entries in said 'Series' title field.

30 21. The system of Claim 20, wherein said means for searching said database according to program title comprises a search engine for searching said 'Title' index.

22. The system of Claim 18, wherein said 'Program' object includes fields for:
- Title;
  - Episode title;
  - 5 Description;
  - Actors
  - Hosts;
  - Guest stars; and
  - Directors.
- 10
23. The system of Claim 22, wherein said database further comprises an 'Actor' index, said 'Actor' index being built from entries in said 'Actors,' 'Hosts,' and 'Guest stars' fields.
- 15
24. The system of Claim 23, wherein said database further comprises a 'Director' index, said Director' index being built from entries in said 'Director' field.
- 20
25. The system of Claim 24, wherein said means for searching said database according to program attributes comprises a search engine for searching said 'Actor' and said 'Director' indices.
- 25
26. The system of Claim 18, wherein said database further comprises a 'Title word' index, said 'Title word' index being built from said 'Title' fields and said 'Episode title' fields.
- 30
27. The system of Claim 26, wherein said database further comprise a 'Key word' index, said 'Key word' index being built from words in said 'Description' field, said 'Actors' field, said 'Hosts' field and said 'Guest stars' field.

28. The system of Claim 27, wherein said means for searching said database according to key words comprises a search engine for searching said 'Title word' index and said 'Key word' index.
- 5 29. A method of searching a distributed, interactive television program guide database, wherein a viewer searches said program guide database to identify programs of interest, comprising the steps of:
- providing a server;
  - providing a client, wherein said client is in periodic communication
  - 10 with said server, and wherein said client downloads current program information from said server;
  - providing a program guide database resident on said client, wherein said program information is imported into said database;
  - providing an interactive viewer interface displayed on a display
  - 15 means in communication with said client;
  - providing means for interacting with said viewer interface by said viewer; and
  - searching said database by said viewer according to at least one of:
  - program title;
  - 20 indexed program attributes; and
  - key words.
30. The method of Claim 29, wherein said system is a component of an interactive, network-based video recording system.
- 25 31. The method of Claim 29, wherein said interface comprises a plurality of screens having interface elements for navigation, entering search values and displaying search results.
- 30 32. The method of Claim 31, wherein said means for interacting with said interface comprises a remote control unit, said remote control unit communicating with said client by means of a data signal.

33. The method of Claim 32, wherein said data signal is embedded in a carrier signal.

34. The method of Claim 32, wherein said step of searching said  
5 database according to program title comprises the steps of  
optionally, selecting a program category in a first screen; and  
entering a program title in a second screen, said second screen  
comprising:

10 a virtual alphanumeric keypad for entering characters to spell  
said program title;  
a text box for displaying said entered characters; and  
a scrollable list of program titles, wherein a prefix  
matching feature causes said list of program titles to automatically  
scroll to titles in said list having prefixes that match a character string  
15 displayed in said text box.

35. The method of Claim 34, wherein said viewer enters characters by  
activating controls on said remote control that correspond to virtual controls  
on said keypad.

20

36. The method of Claim 32, wherein said step of searching said  
database according to indexed attributes comprises one of the steps of:

searching according to Actor name;  
searching according to Director name; and  
25 optionally selecting a program category prior to either of said steps of  
searching according to Actor name or searching according to Director name.

37. The method of Claim 36, wherein a screen for searching according to  
Actor name comprises:

30 a virtual alphanumeric keypad for entering characters to spell said  
Actor name;  
a text box for displaying said entered characters; and



a scrollable list of Actor names, wherein a prefix matching feature causes said list of Actor names to automatically scroll to Actor names in said list having prefixes that match a character string displayed in said text box.

5 38. The method of Claim 37, wherein said viewer enters characters by activating controls on said remote control that correspond to virtual controls on said keypad.

39. The method of Claim 36, wherein a screen for searching according to  
10 Director name comprises:

a virtual alphanumeric keypad for entering characters to spell said Director name;

a text box for displaying said entered characters; and

a scrollable list of Director names, wherein a prefix matching feature  
15 causes said list of Director names to automatically scroll to Director names in said list having prefixes that match a character string displayed in said text box.

40. The method of Claim 39, wherein said viewer enters characters by  
20 activating controls on said remote control that correspond to virtual controls on said keypad.

41. The method of Claim 32, wherein said step of searching said database according to key word comprises the steps of:

25 optionally, selecting a program category from a first screen; and  
entering a key word in a second screen, said second screen comprising

a virtual alphanumeric keypad for entering characters to spell said key word; and

30 a text box for displaying said entered characters.

42. The method of Claim 41, wherein said viewer enters characters by activating controls on said remote control that correspond to virtual controls on said keypad.

5 43. The method of Claim 32, wherein said indexed attributes include any of:

Actor name;

Director name;

Host name;

10 Guest star name;

Choreographer;

Year of release;

Category; and

Language.

15

44. The method of Claim 29, wherein said program guide database comprises an object-oriented database application, said database application including at least:

a 'Series' object; and

20 a 'Program' object.

45. The method of Claim 44, wherein said 'Series' object includes a series 'Title' field.

25 46. The method of Claim 45, wherein said program guide database further comprises a 'Title' index, said 'Title' index being built from said series 'Title' field.

30 47. The method of Claim 46, wherein said means for searching said database according to program title comprises a search engine for searching said 'Title' index.

48. The method of Claim 44, wherein said 'Program' object includes fields for:
- Title;
  - Episode title;
  - 5 Description;
  - Actors
  - Hosts;
  - Guest stars; and
  - Directors.
- 10
49. The method of Claim 48, wherein said database further comprises an 'Actor' index, said 'Actor' index being built from said 'Actors,' 'Hosts', and 'Guest stars' fields.
- 15
50. The method of Claim 49, wherein said database further comprises a 'Director' index, said 'Director' index being built from entries in said 'Director' field.
- 20
51. The method of Claim 50, wherein said means for searching said database according to 'Actor' or 'Director' or comprises a search engine for searching said 'Actor' and said 'Director' indices.
- 25
52. The method of Claim 44, wherein said database further comprises a 'Title word' index, said 'Title word' index being built from entries in said 'Title' fields and said 'Episode title' fields.
- 30
53. The method of Claim 52, wherein said database further comprise a 'Key word' index, said 'Key word' index being built from said words in said 'Description' field, said 'Actors' field, said 'Hosts' field and said 'Guest stars' field.

54. The method of Claim 53, wherein said means for searching said database according to key words comprises a search engine for searching said 'Title word' index and said 'Key word' index.

5

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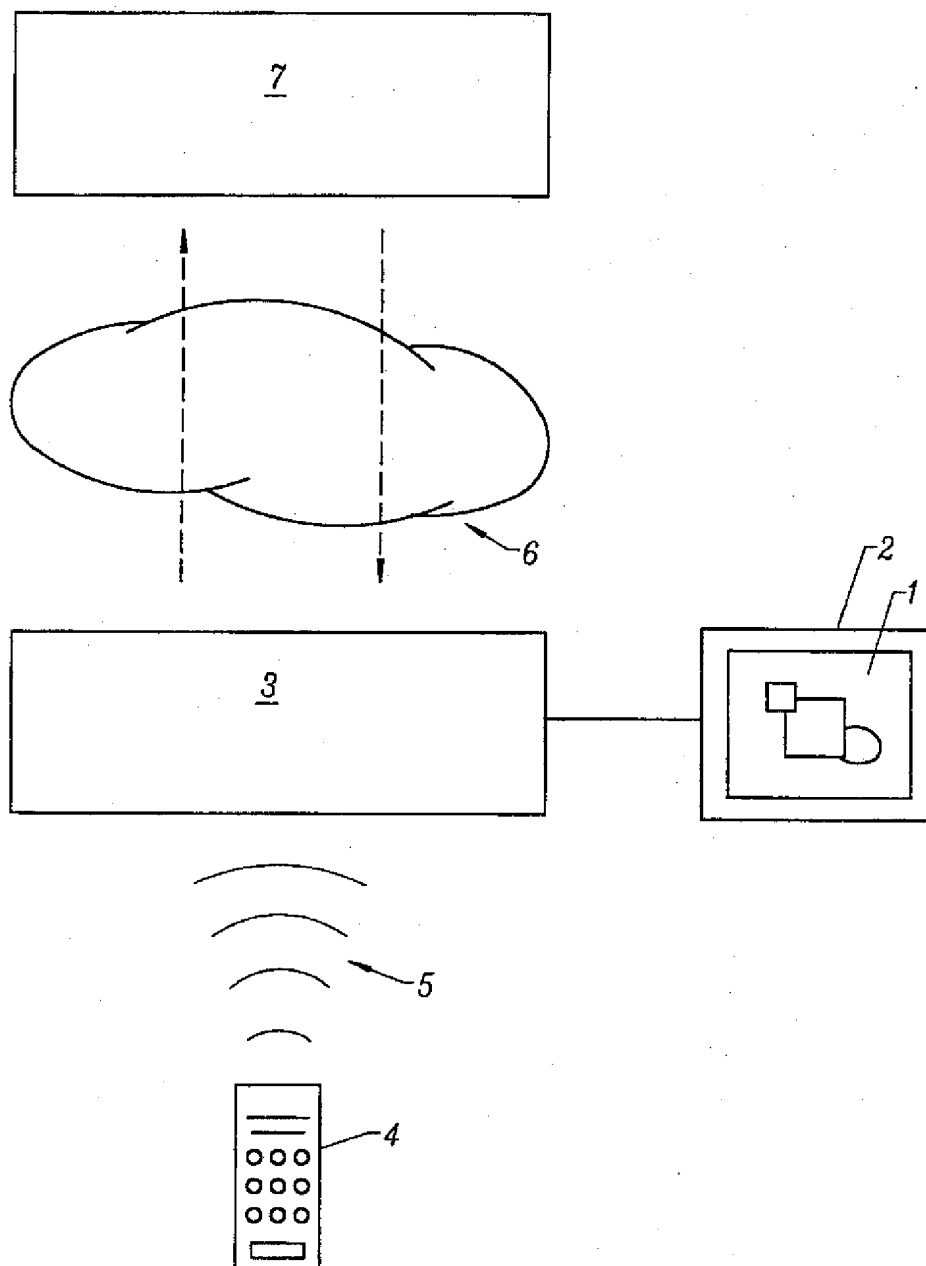


FIG. 1

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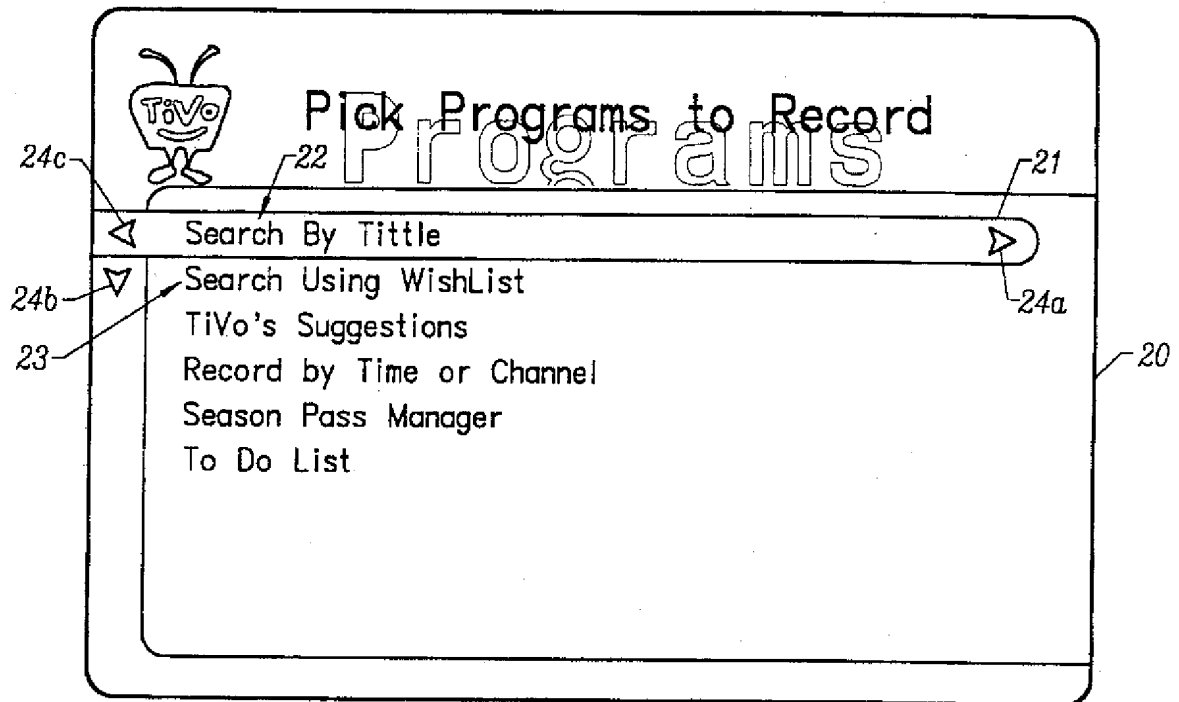


FIG. 2

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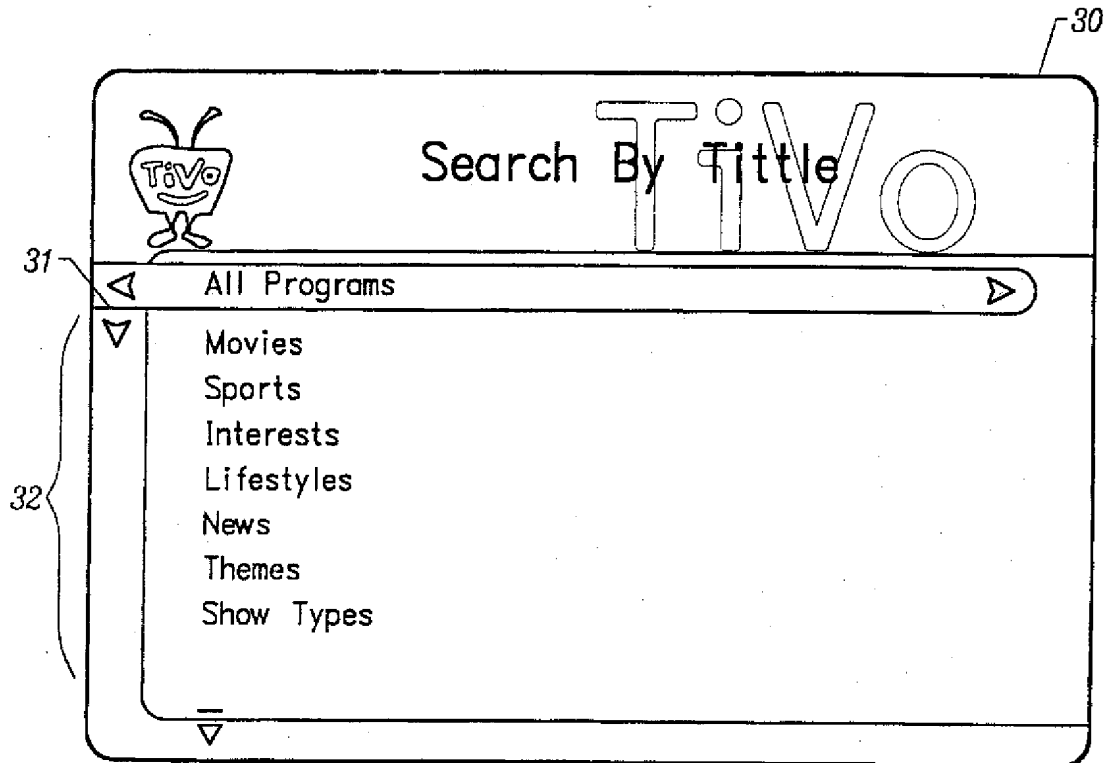


FIG. 3

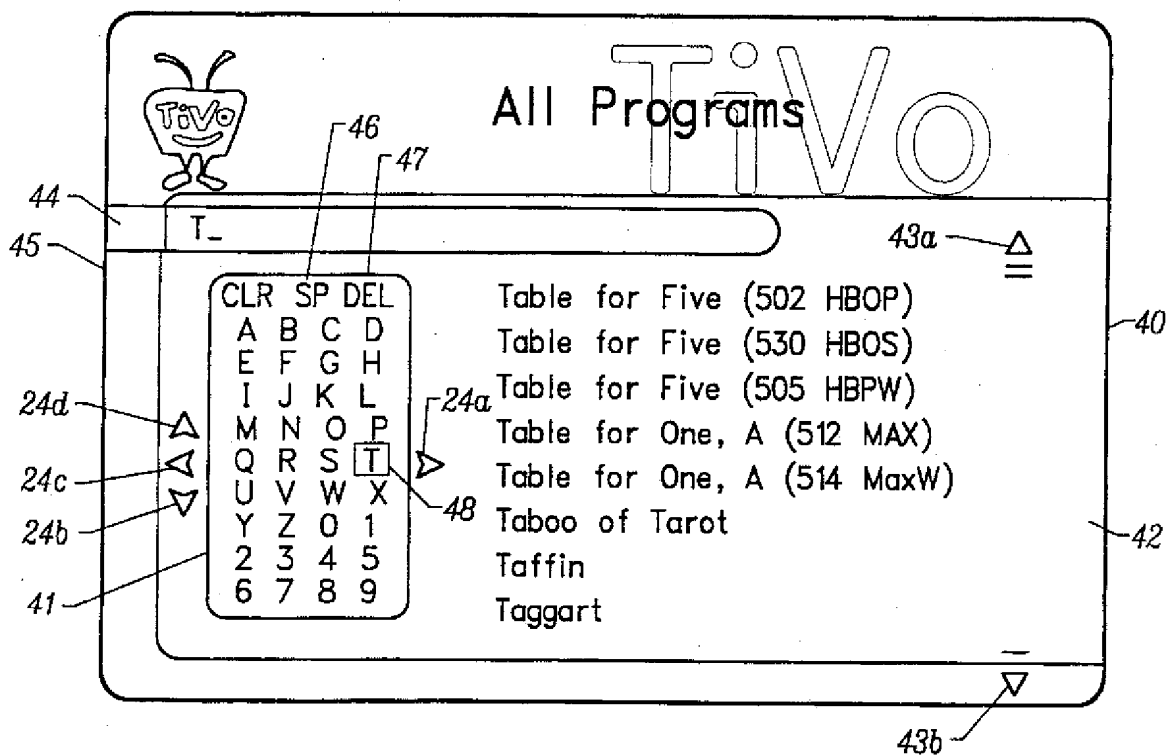


FIG. 4

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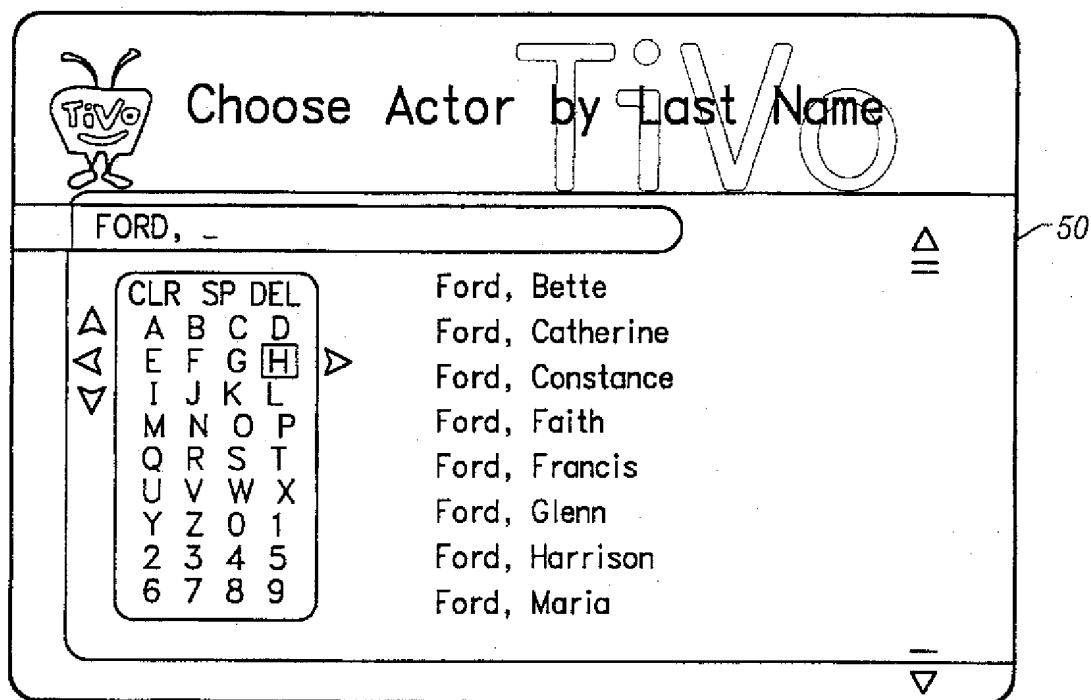


FIG. 5

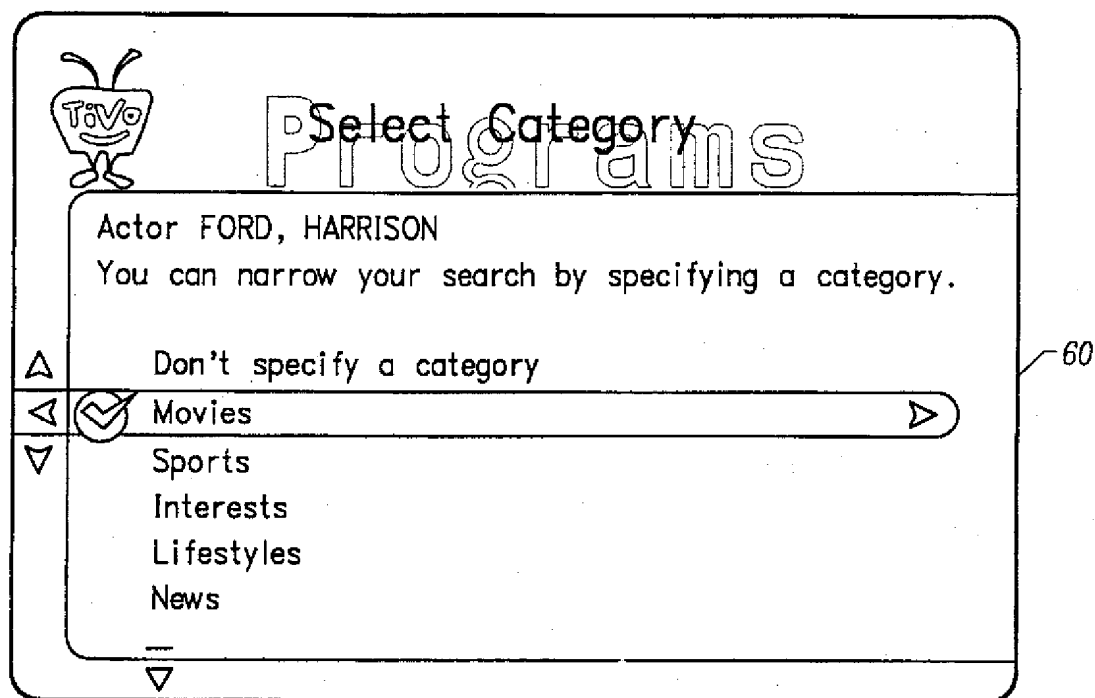


FIG. 6



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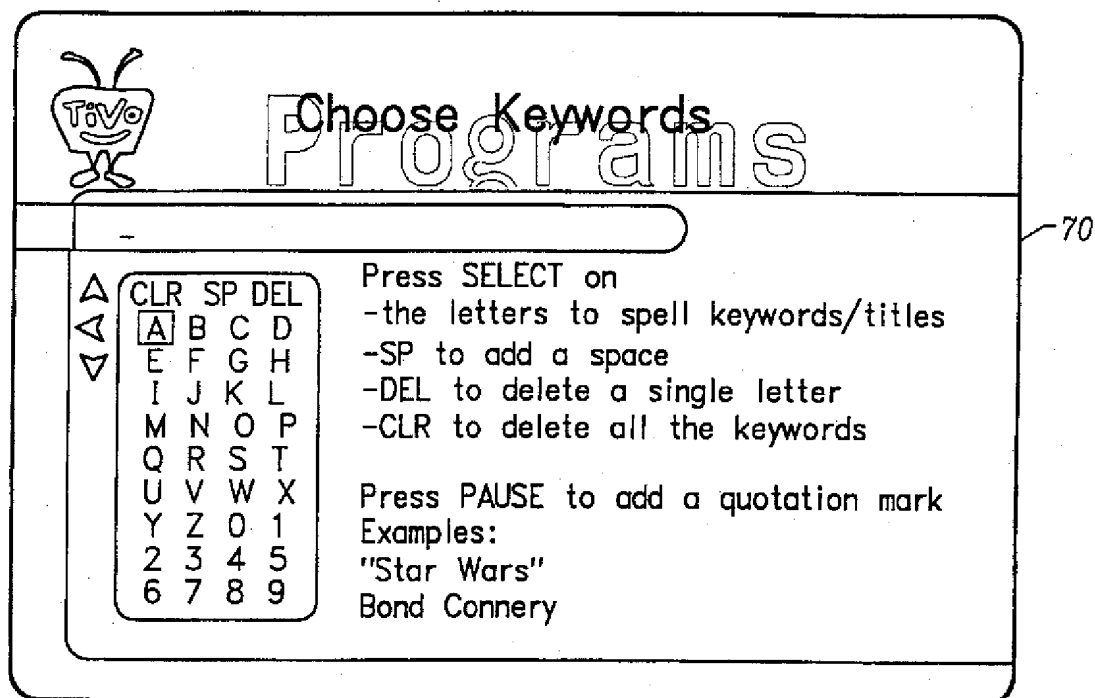


FIG. 7

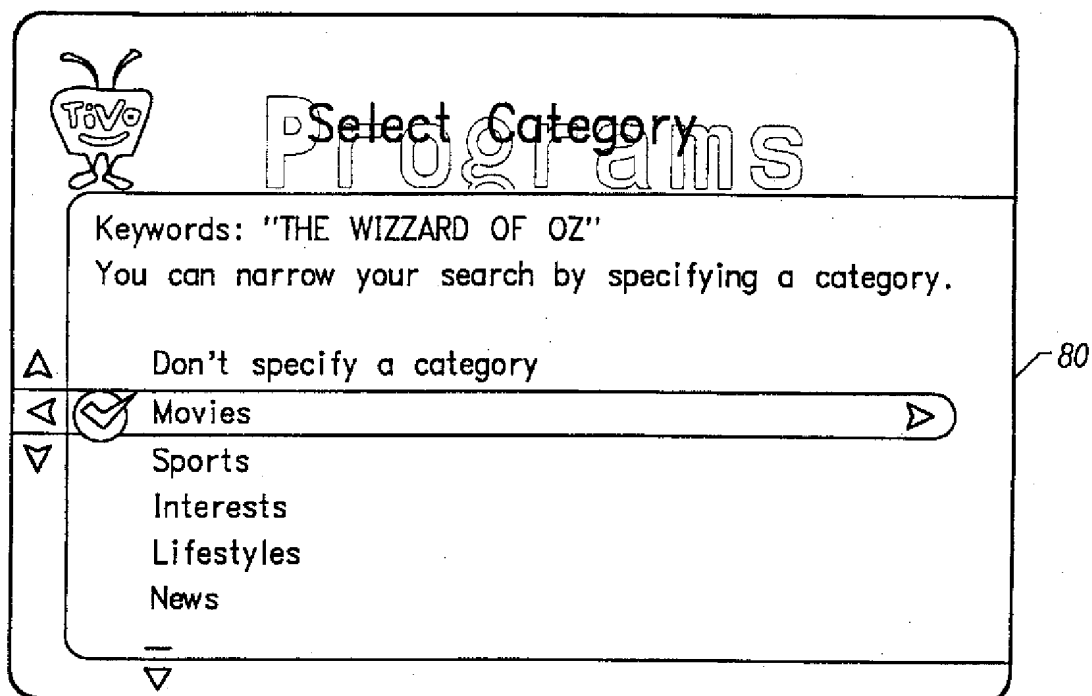


FIG. 8